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Investigating the Use and Effectiveness of the Istation Advanced Reading Program with Fourth-Grade At-Risk Struggling Readers

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INVESTIGATING THE USE AND EFFECTIVENESS OF THE ISTATION ADVANCED READING PROGRAM WITH FOURTH GRADE AT-RISK STRUGGLING READERS

A Dissertation

by

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ABSTRACT

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The purpose of this study is to investigate the effects of computer-based-instruction (CBI) and multimedia when used as an intervention with upper elementary students experiencing reading difficulties on the State of Texas Assessment of Academic Readiness (STAAR) Reading Assessments. The researcher employed a quantitative, causal-comparative research design for this study. A Texas supplemental reading program, the *Istation* Advanced Reading Program, was used as a Response to Intervention (RTI) for those at-risk students of failing their Reading STAAR Test in the fourth grade and to sustain an effective reading program district-wide.

Archived data was collected from three South Texas Title I elementary public schools for the academic school years 2015 to 2016 and 2016 to 2017. Throughout the school year, non-at-risk and at-risk students were monitored by using the *Istation* Indicators of Progress (ISIP). The district's elementary schools placed all the fourth-grade students in a reading intervention program according to their third grade STAAR reading scaled scores. Descriptive Statistics was used as part of the data analysis strategy. Group Report comparisons detected significant changes on their reading achievement with the ISIP scores. The students' *Istation* (ISIP) scores results demonstrated the effect of *Istation* on the reading comprehension skills needed for the 2017 Fourth-Grade STAAR Reading Assessment.

DEDICATION

The competition of my doctoral studies would not have been possible without the love and support of my family, my close friends, and my girlfriend. To my mother and father who are resting in Heaven but whose blessing I feel every day of my life and to my son, Andy "Pilo" and his baby Boy (Gavin), who inspired me to complete my doctoral studies this year.

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Finally, I could not have completed this process without the support and guidance of my family members, my colleagues, and my close friends. I know that I missed-out on a lot of the family events and celebrations, but I will now have time to make up for that lost time. I love you all very much and may Almighty GOD bless our families today and every day.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

One of the most significant challenges to U.S. schools today is that elementary students are struggling in their reading classes. Moreover, with the current culture of high-stakes testing, educators are concerned with the fact that effective interventions are needed to help improve the performance of struggling elementary readers on their state-mandated standardized testing (U.S. Department of Education, 2017). As a result of state and federal mandates, public schools are searching for intervention methods, for their “tiered” students that are reliable and scientifically research-based (NCLB, 2002).

Reading is defined by the National Assessment of Education Progress (NAEP) Reading Framework as a dynamic cognitive process that allows the reader to understand written text, interpret meaning, and use meaning according to the type and purpose of the text (Department of Education, National Center for Education Statistics, 2011). Alarmingly, the National Assessment of Educational Progress (NAEP, 2017) reports that by fourth grade, one-third of our students are failing to attain basic reading skills. Hence, American students are struggling with their reading skills and something must be done to help improve their reading skills to optimal levels.

According to a 2014 research report from the Annie E. Casey Foundation, some 66 percent of U.S. fourth-graders read below their grade level. This number jumps to 80 percent among fourth-graders from low-income families. It has been argued that students often begin to struggle academically around fourth grade and enter into what is commonly referred to as the “fourth grade slump.” This “reading slump” is a shift in reading development in the fourth grade from “learning to read” to “reading to learn” and it makes meeting the needs of at-risk readers a priority for teachers of fourth grade and beyond (Allington, 2011). Researchers agree that teaching students to read requires early identification of students at-risk for experiencing reading difficulties and providing intensive interventions to meet their needs (Crawford & Torgenson, 2006).

Current research suggests that reading needs to be constructive and interactive, and struggling readers need to become constructive responsive readers (Ciampa, 2012). Becoming a proficient reader by Grade Three is a key predictor of future academic success, including high school graduation (Fiester, 2013). Thus, solid reading skills are the critical element to our students’ future in academic success. Children who do not master literacy skills in the early grades remain at risk in both academic and social well-being throughout their schooling and into adulthood for they are more likely to be retained a grade in school, drop out of high school, become a teen parent, or enter the juvenile justice system (Hernandez, 2011). Consequently, these children become at-risk students because of their low achievement on mandatory (annual) state reading tests. Thus, the educational dilemma begins because educators are responsible for providing students with practical and research-based instruction that promotes academic growth (Cox, 2017).

According to the United States Department of Education (2014) remediation measures must be implemented, in order, to ensure that at-risk students meet the challenging state academic standards. The U.S. Department of Education (2014) identified that reading difficulties and disabilities present serious and potentially lifelong challenges. Hence, federal legislation soon followed to provide a solution to the literacy challenges in American schools. A solution to this national dilemma was the legislation developed by the U.S. Department of Education, like the “No Child Left-Behind Act” of 2001 (NCLB) and the 2015 reauthorization of the Elementary and Secondary Education Act (ESEA) as amended by the “Every Student Succeeds Act” (ESSA). However, this legislation has many administrators and educators alike reporting the feeling of unimagined pressure to pursue the most effective reading instructional programs available for their struggling students in reading.

Recent reading test results indicate that NCLB Title 1 funding has failed to close the achievement gap between low and middle socioeconomic students. Moreover, for many years, educators and policymakers looking for strategies to close the achievement gap and improve student learning have sought solutions involving new technology, especially for students placed in groups that are at-risk of failure (Alliance for Excellent Education, 2014)..Accordingly, the U.S. Department of Education (2017) reports that educators are worried about declining student growth in the subject area of reading, however, funding is available for assistance in expanding their efforts to infuse an evidence-based culture when it comes to using educational technology in their schools and classrooms.

Title 1, Part A (Title 1) of the Elementary and Secondary Education Act (ESEA), as amended by “the Every Student Succeeds Act” (ESSA) provides financial assistance to local educational agencies (LEAs) and schools with high numbers or high percentages of children from low-income families to help ensure that all children meet challenging state academic standards. Federal funds are currently allocated through four statutory formulas that are based primarily on census poverty estimates and the cost of education in each state (U.S. Department of Education, 2018). Basic grants provide funds to LEAs in which the number of children counted in the formula is at least 10 and exceeds two percent of an LEA’s school-age population.

Funds are combined to provide all students with instruction aligned to grade level specific state standards including differentiation and enrichment services as needed. To meet this goal, support is provided for classroom teachers with staff development; the purchase of textbooks, equipment; and the implement of technology for instructional purposes.

With the increases in the availability of technology in the classroom many educators are looking to computer-based reading programs to help close the gap in student reading achievement (Setter & Hughes, 2010). The current use of technology for instructional purposes has great impact on students' engagement, diverse learning styles, and student outcomes. However, because the range of educational interventions varies (from specific software to computing devices to online content delivery systems), no single research study can address the general question of whether technology improves student outcomes (Tamin, Bernard, Borokhovski, Abrami, & Schmid, 2011). As such, the purpose of this study is to investigate the effectiveness of technology with reading interventions.

Reading comprehension is the end goal of reading development and it involves the ability to make literal and inferential meaning from what is read in text (Kresky, 2012). Researchers agree that teaching students to read requires early identification of students at risk for experiencing reading difficulties and providing intensive interventions to meet their needs (Crawford & Torgeson, 2006). Thus, in a concentrated effort to address reading content gaps, schools have incorporated intense intervention programs, differentiated instruction, and technology integration in the classroom.

Cook and Cook (2011) emphasized the importance of the educators' role as an advocate for all learners and their needs. Thus, Texas educators have come to realize that reading instruction is not *one-size-fits-all* and this new mindset has led to the development of programs, initiatives and frameworks to address the wide range of needs concerning struggling readers (Corwin, 2016). In South Texas, pubic school administrators are now faced with the dilemma of addressing the learning needs of students who have been identified as struggling learners or at-risk students. As a result, of state and federal mandates, public schools are searching for intervention methods, for their "tiered" students, that are reliable and scientifically research-based (NCLB, 2002).

Researchers Hill, Seth, Lemon, and Partanen (2012) stated that the implementation of interventions requires the leadership oversight to monitor the organization, accuracy, and timeliness of the implementation of the interventions. According to Hill (et.al 2012) the efficacy of a Tier 2 elementary reading intervention, depends on the implementation of the program with fidelity and instructional alignment between the tiers. The efficiency of any instructional strategies also depends on the skill level of the student (Conner, Morrison, Fishman, Underwood, & Schatschineider, 2007).

Tools that educators can use within their classrooms include computer-based instruction (CBI) which has evolved from the original computer-assisted instruction (CAI) of the 1960's. For decades, researchers have argued that (CAI) has the potential to change the nature of teaching from the traditional, teacher-centered model to a more student-centered instructional approach which especially benefits students at risk (Waxman &n Huang, 1996; Waxman, Padron, & Arnold, 2001).

For this study, CAI refers to those who use technology to enhance reading achievement and are usually supplementary in nature, such as when students use computer labs for additional reading practice. CAI has developed from limited drill-and-practice programs to more sophisticated learning systems with highly interactive and complex functions, including simulations and virtual laboratories (Bernard, Borokhovski, Tamin & Abrami, 2013; Slavin & Lake, 2008; Song, 2002). Whereby, developments in computer technology have equally provided students with a broader range of learning opportunities as well as increased control over their learning (Bernard et al., 2013).

Computer-assisted instruction has been studied for its effects on lower achieving students for the past 25 years (U.S. Department of Education, 2009), however, some researchers have argued that CAI has no significant effect on student learning. However, according to Barley, Lauer, Arens, Apthrop, Englert, Snow, and Akiba (2002) the CAI effectiveness has been attributed to its being non-judgmental and motivational, while giving immediate and frequent feedback; individualized learning to meet student needs, allowing for more student autonomy, and providing multi-sensory components. Recommendation is that struggling students should also be encouraged to actively participate in their own learning, instead of simply passively receiving information (Boone & Higgins, 2007; Mayer, 2009).

The definition of CAI in the context of this study is modeled after Moreno and Mayer's (2007) discussion of "interactive multimodal learning environment," (p. 310) which consists of a two-way interaction between the learner and the learning environment (i.e., computer or handheld device). Instruction is provided via the application rather than a teacher and the application is both reliant on and responsive to the learner's actions. CAI is used with individuals or pairs of students, and a distinction is drawn between technology used as a part of core instruction and technology used for intervention (Kunkel, 2015).

Smith and Okolo (2010) stated that the necessary connections students must make among concepts and key terms can be solidified through multimedia components embedded within software and Internet-Based solutions. Multimedia has the potential to transform rote learning activities into cognitive based lessons with engaging and motivational lessons aimed at diminishing the cognitive overload that many struggling reading students experience in the early grades (Mayer, 2009). The term “multimedia” generally means using some combination of text, graphics, animation, video, music, voice and sound effects to communicate (Gaytan & Slate, 2002).

In our American public schools, approximately 20 percent of students are not successful in the core reading instruction despite a good curriculum and effective instructional practices. For these and many other reasons, Response to Intervention (RTI) has been the most significant educational reform in this country in the past 50 years (Burns, Appleton, & Stehouwer, 2005). RTI is a federally mandated educational reform effort designed to improve teaching and learning in all schools across the United States (Wixson, 2011).

Research has consistently supported the educational effectiveness of RTI approaches in enhancing students’ learning (Burns, et. al 2005). RTI was created to identify and support students who are at risk of failing, the RTI is intended to: (a) ensure high-quality classroom instruction and, (b) provide additional instruction (interventions) to students who need it (NCRTI, 2012). Assessment is perhaps the cornerstone for the RTI, for formative assessments allow educators to screen student skills in order to identify their progress.

To narrow the reading gap, the RTI model, many innovative resources and materials, software, extensive professional development days, and instructional leadership planning time-periods are used to improve the performance of our struggling readers. One of the major objectives of Tier 2 reading interventions is to close the achievement gap between at-risk readers and students who read on grade level.

The students' reading success is the result we are all striving for in our schools. Since 2012, the Texas Students Using Curriculum Content to Ensure Sustained Success (SUCCESS) program has offered state-funded access to computerized interactive reading and mathematics programs provided by two vendors, *Istation* Early Reading Program and *Istation* Advanced Reading Programs, plus, Think -thru- Math (TTM) to all Texas public school students in grades three to eight.

Imagination Station or Istation (the reading software company) is a leading provider of richly animated and interactive computer-adaptive assessments known as *Istation's* Indicators of Progress (ISIP), differentiated computer-delivered intervention programs, teacher resources, Lexile-leveled online books, instant data reporting and customer support, as well as professional development for use by educators and students in grades Pre-K through 12. The Advanced Reading Programs and TTM are adaptive programs designed to support student achievement by adjusting content based on student skill level and incorporating their assessments to track student performance changes (Gibson Consulting Group, 2015).

Looking back, as an elementary teacher, an administrator, parent, and now a novice researcher, I have witnessed the efforts our Title I schools and the process through which administrators go through when they diligently try to implement new instructional and technology programs in order to address the reading deficits and achievement gaps for at-risk students struggling in their reading classes.

Background to the Study

Technology has revolutionized education in the United States. The current use of technology for instructional purposes has great impact on student engagement, diverse learning styles, and student outcomes (Gulek, 2005). This new culture has sparked a renewed interest in identifying effective student interventions, including computer-assisted-instruction (CAI) that increases student performance through engagement and motivation (National Research Council, 2002). According to Anderson (2011), there has been a resurgence in the desire to adapt instruction to the individual needs of the learner with the implementation of technology-based tools which is a good thing for the needs of struggling readers. The reading achievement scores of children in the United States clearly show the need for research in technology and reading.

Recently, the National Assessment of Educational Progress (NAEP) reported in the Nation's Report Card, that a mere 34 percent of fourth grade students were assessed as reading at or above the "proficient" level on the 2015 National Assessment of Educational Progress for reading (National Center for Education Statistics, 2015). As such, the purpose of this study is to investigate the effectiveness of computer-assisted instruction and Internet technology (which contains the embedded multimedia design) with reading intervention programs that can help the at-risk struggling readers in fourth grade.

When digital capabilities (such as engaging online environments, access to a wide array of resources, and interactivity) are incorporated meaningfully into instruction, students have new opportunities to learn and achieve (U.S. Department of Education, Office of Educational Technology, 2010). Evidence suggests that when teachers keep track of student progress; identify students in need of additional instruction; and design stronger instructional programs, students achieve better performance (Conte & Hintze, 2000; Fuchs, Fuchs, Hamlett & Ferguson, 1992; Mathes, Fuchs, & Roberts, 1998). Furthermore, in the state of Texas, educators use learning theories (i.e., constructivism, behaviorism, cognitivism, experiential learning) and best practices (i.e., active learning, positive feedback, collaborative learning process, integrated curriculum, and differentiated curriculum) based on effective research to address these educational issues with standardized testing.

A significant number of students cannot successfully read and comprehend what they have read in texts. This is the case in many Texas schools serving English Language Learners (ELLs). Why do these students struggle with reading and what can be done to increase their success across all subject areas? To address this fact, in 2001, the U.S. Congress passed the No Child Left-Behind Act (NCLB), designed to improve schools through a system of standards-based accountability (SBA).

NCLB's accountability provisions require each state to develop content and achievement standards, measure student progress through tests, and intervene in schools and districts that do not meet the targets or Adequate Yearly Progress (AYP). These accountability provisions have affected every public school and district in the nation. There are many advocates for educational technology, whose focus is on how technology is used for instruction and with the knowledge that teachers need to have as they integrate technology in their instruction (professional development).

Educational technology can be effectively used to help teach basic literacy skills such as phonemic awareness, alphabetic principle, word recognition, alliteration, and comprehension. Today, the use of specialized educational software applications can help support and enhance students' literacy skills. One of those specialized educational applications is "adaptive instruction." Adaptive instruction describes the process of delivering instruction custom-tailored to the learners' needs, abilities, interests, and capabilities (Herlo, 2012). Adaptive Instruction and Adaptive Learning go hand-in-hand falling under the umbrella term of Adaptive Educational Systems. The belief of adaptive instruction is that approaches and techniques using hardware and software solutions may be leveraged and designed to improve learner outcomes (Herlo, 2012).

Adaptive learning tools are a relatively new technology based on an age-old pedagogical concept, namely, personalized instruction for each student. Shute (2012) suggests that the major challenge of an adaptive educational solution is not only the accurate identification of learner characteristics, but that adaptive learner content is based on learner differences of incoming knowledge and skill. Research studies indicate that incoming knowledge is “the single most important determinant of subsequent learning (Shulte & Zapata, 2012). Furthermore, another reason for the success of adaptive content is that it ties to the differences of individuals’ cultural and societal backgrounds.

In retrospect, the passage of the No Child Left Behind Act of 2001 placed heavy emphasis on outcomes for all students, requiring school districts to adopt evidence-based teaching methods and interventions (U.S. Department of Education, 2005). No Child Left Behind (NCLB, 2001) was created with a focus on improving reading and math skills with an emphasis on children from low socio-economic status. Public schools were required to adopt instructional programs and approaches in order to help meet the needs of struggling learners.

Under the new law, Every Student Succeeds Act (ESSA) of 2015, more emphasis is placed on improved student outcomes (accountability) and protections for America’s disadvantaged students that include our English Language Learners (ELLs) and students with special needs. In Texas, we use the Response to Intervention (RTI) model to help these students meet the challenges of their academic rigors

The Response to Intervention (RTI) model is implemented under the supervision and direction of the Texas Education Agency (TEA). The TEA focuses on four key elements in its definition of RTI. Response to Intervention can be described as a model addressing the needs of all students through a continuum of services. RTI provides for: (1) High quality instruction and scientific research based tiered interventions aligned with student need; (2) Frequent monitoring of student progress to make results-based academic or behavioral decisions;(3) Data-based school improvement; and (4) The application of student response data to important educational decisions such as those regarding placement, intervention, curriculum, and instructional methodologies (TEA, 2009).

The RTI model provides specific provisions of the Individuals with Disabilities Education Act (IDEA) legislation that all public schools must follow the necessary state and federal mandates related to RTI and student success. RTI is a critical and effective intervention method for reading instruction at the elementary levels (TEA, 2009). Elliot (2008) explained how important it is to student learning to provide the correct and most effective intervention methods in all core subjects for all students regardless of cognitive abilities.

All assessments and differentiated instruction for at-risk children must be addressed as specified through the Response to Intervention Model. In the RTI process, if a student is unsuccessful in Tier 1 after 4-6 weeks, then he or she is elevated to Tier 2 for more intense reading interventions (McCook, 2006). McCook also noted that Tier 2 interventions typically involve “pull-out” assistance in some form of small group instruction (a ratio of 1:5-10). Tier 2 students spent 30 minutes per day in the small group receiving the *Istation* instructional services.

In Texas, the Texas Students Using Curriculum Content to Ensure Sustained Success (SUCCESS) student initiative provides state-funded access to interactive mathematics and reading programs for Texas public school students in grades three through eight (Garland, Shields, Booth, Shaw & Shamii-Shore, 2015).

For this study, the researcher investigates a computer-assisted reading instructional program focused on the reading problems encountered by at-risk students in the third through fourt- grade levels. The *Istation* Advanced Reading Program is addressed through the Texas Education Agency's Accelerated Reading Interventions under the SUCCESS program. *Istation* is used as a reading "pull-out" program where the selected students are provided with individualized instruction via computer laptops at a computer lab or individual workstations. Students are continuously monitored with the *Istation's* Indicators of Progress (ISIP) which are computer-adaptive assessments. The ISIP immediately places students on a personalized instructional path unique to his or her needs (Torgensen, 2012).

Istation's Indicators of Progress (ISIP) is a sophisticated Internet and Web-delivered computer-adaptive testing system that provides continuous progress monitoring assessments in the critical domains of reading in prekindergarten through eighth grade. ISIP results drive recursive assessment instructional-decision loops with *Istation* Reading (Patarapichayatham and Roden, 2014). These indicators of progress are so advanced and precise that they have become a real life predictor of academic success on the STAAR Reading Assessments in any given school year.

Torgesen (2014) further explains that ISIP is a computer adaptive testing system that administers student-friendly, short tests through the internet to determine each student's overall reading ability and then adapts difficulty of questions based on their reading performance. There are many benefits to this computer adaptive testing system.

Benefits of ISIP include:

- Age appropriate interface for students
- Immediate access to student records
- Rich animation to keep students motivated and engaged
- Automatic adjustment of test to each student's ability
- Comprehensive measures of student ability administered in less than 20 minutes.

Aligned to the federal No Child Left Behind Act (NCLB) and the findings of the National Reading Panel (2000) and National Early Reading Panel (2008), the *Istation* curriculum provides systematic and explicit instruction in the essential reading areas of phonological and phonemic awareness, phonics, fluency rate, vocabulary, and comprehension. To prepare students for academic rigor and ensure success in the classroom, they must be able to comprehend academic vocabulary. The latter is especially challenging for English language learners (ELLs).

Statement of the Problem

In South Texas, public schools are faced with the dilemma of addressing the learning needs of students who have been identified as struggling readers. Educators often struggle to obtain effective, individualized strategies to address the needs of their Tier 2 and Tier 3 at-risk students. Most educators use small group and individual student assistance in order to meet the learning needs of struggling learners. Some educators incorporate computerized programs, push-in assistance, or additional personnel in order to help students who struggle in reading.

According to Texas Education Agency (2015), the majority of students are economically disadvantaged (98%) and are at-risk (67%). Generally, students receiving bilingual education services are on multiple reading levels, and lag behind their peers, as noted from *Istation* archival data collected during a research study (Torgesen, 2004). Additionally, the U. S. Department of Education, Office of Education Technology (2012) states that technology in education can be seen as a tool that can transform the learning activities among teachers, students, and resources within a classroom.

Purpose of Study

The purpose of this study was to determine the effectiveness of the *Istation* reading program implemented as a Tier 2 intervention with the Response to Intervention process (RTI). As a result, of state and federal mandates, public schools are searching for intervention methods for their "tiered" students that are reliable and scientifically research-based (NCLB, 2002). In most cases, students in Tier 2 and Tier 3 are in danger of failing their reading classes.

With archival information from the *Istation's* Indicators of Progress (ISIP), this study compares the progress of fourth-grade at-risk students from three elementary school campuses in a small school district in South Texas. The progress of the sample groups of Tier 2 reading students was tracked and monitored very closely for the duration of this study. Progress was measured by using their *Istation* reading percentile levels called Index Scores. The Tier 2 students with a lower reading percentile were compared to those Tier 2 students with a higher reading percentile. All students received the *Istation* curriculum and they were monitored and assessed on a monthly-basis. For the purpose, of this study, academic achievement was measured by performance on the ISIP. The ISIP is an online continuous progress monitoring system.

There are always extraneous and confounding variables that affect a student's ability to learn to read. Thus, other factors like the motivational factor will be included in this study, too. The goal of the researcher was to gain a deeper understanding of the fourth-grade English

Language Learners' (ELL) and their learning deficits, and how educators can best help them overcome those learning barriers.

Significance of Study

This study is significant in its contribution to the body of knowledge on effective interventions that help ameliorate the possibility of elementary at-risk students from failing their Reading STAAR Tests. The significance of this study is to examine the effectiveness of the *Istation* Advanced Reading Program when used as a remediation tool for a population of fourth-grade at-risk, migrant, female, male, and EL students who are in danger of failing their state-mandated tests. The researcher also examined the other non-at-risk students who used *Istation* as an enrichment and supplemental reading program. In order to validate the effectiveness of the study, the researcher will investigate differences between the groups and find the grouping variable.

The researcher investigated the learning outcomes of ELL students when they are exposed to computer-based instruction as a reading intervention. Current research suggests that reading needs to be constructive and interactive, and struggling readers especially need to become constructively responsive readers (Ciampa, 2012). The perspectives taken by the principal investigator on the role of technology in class room instruction influences the research questions pursued and the approach taken to answer them accordingly.

Research Questions

According to the National Reading Panel (2012) using computer technology for reading instruction is promising, and it incorporates the five key elements that must be included in the use of technology for reading. These elements are phonemic awareness, phonics, reading fluency, vocabulary, and reading comprehension. All five elements are included in the *Istation* program. The principle research questions for this study are the following five questions:

RQ1. Is there a significant difference between English Language (EL) and non-EL students' STAAR reading scaled scores before and after implementation of the *Istation* Advanced Reading Program with all readers?

RQ2. Is there a significant difference between Migrant and Non-migrant students reading scaled scores who did participated in the Istation Advanced Reading Program?

RQ3. Is there is a significant difference between STAAR Reading scaled scores of male and female students who participated in the *Istation* Advanced Reading Program?

RQ4. Does the *Istation* Advanced Reading Program increase the achievement of At-Risk struggling readers compared to the Non-at-risk readers?

RQ5. Is there a significant difference between STAAR Reading scaled scores based on the *Istation* time usage?

Statement of the Hypothesis

The main objective of this study is to investigate the effectiveness of technology-based instruction as measured by the learning outcomes of at-risk reading students. The researcher's null hypothesis is that both computer-based instruction and the traditional direct instruction method will improve the students' achievement in reading skills and fluency levels during the 24-week period of the *Istation* program implementation.

The alternative hypothesis is: the use of *Istation*, when used as a daily reading intervention during reading class time, will improve all students reading skills. These selected reading students were pulled out of their regular classroom to implement the *Istation* program in the reading computer labs.

Identification of Variables

For this study, the independent variable in the quantitative section of the study was the *Istation* Advanced Reading Program (technology embedded curriculum). The dependent variable was literacy learning as evidenced by the State of Texas Assessment of Reading Readiness (STAAR) test. Furthermore, student learning and achievement was demonstrated by the *Istation's* measures of academic progress for each individual.

Literacy is a complex construct. Literacy can be evaluated through many different outcome measures such as phonemic awareness or reading comprehension. The goal of this study was to determine the effectiveness of the computer-assisted instruction interventions from a program evaluation perspective.

Theoretical Frameworks

In order to understand how struggling reading students build new knowledge, and how students respond to different classroom contexts, we use information from the learning theories of behaviorism which encompasses other learning theories with behaviorist underpinnings and the relatively new cognitive theory of multimedia learning. I will expand on each of these theories as it relates to the focus of this very significant educational study.

In the 20th century, B.F. Skinner is probably the most influential behaviorist, who applied his learning theories to the methods of instruction in education. He stated that "behaviorism is primarily concerned with observable and measurable aspects of human behavior." In defining behavior, behaviorist theories emphasize changes in behavior that result from the stimulus-response associations made by the learner (Gillani, 2003).

According to Gillani (2003) the principles of behavioral theories and applied behavioral analysis have been successfully applied to the design of instruction. He stated that "numerous teaching models have been developed based on the principles of behavioral learning theories" (p.33). Most of these teaching models share common characteristics that are derived from the principles of behavioral theories that include assessment, intervention, and evaluation.

The purpose of assessment is to pretest the learner's level and set the goal and objective (Gillani, 2003). He goes on to explain what an intervention program should be, he stated "to achieve the objectives, educators must develop an academic intervention program such as sequenced instructional materials and appropriate practice with feedback and reinforcements" (Gillani, 2003).

Finally, the learners should be evaluated on their competencies in relation to the goal that was set for the intervention. If responses on the evaluation are correct, then, the learner should be guided to the next level of instruction. If they cannot provide the right responses, then, they are guided back to the intervention component for further instruction and clarification of concepts.

Numerous behavioral modification and instructional programs including mastery learning, educational software, programmed instruction, and computer-assisted instruction have been based on Skinner's operant conditioning and programmed instruction philosophy (Gillani, 2003). According to Parkay and Haas (2000), "an individual selects one response instead of another because of prior conditioning and psychological drives existing at the moment of the action."

According to Moreno and Mayer (2007) the cognitive theory of multimedia learning is a form of learning supported by different sources of information (e.g., text and graphics) being handled jointly in order to understand and memorize a given context (facts, concepts, procedures, etc.). In the process of multimedia learning, material is represented in five forms: as words and pictures, in a multimedia presentation; acoustic and iconic representations in sensory memory; sounds and images in working memory; and knowledge in long-term memory.

The *Istation* Advanced Reading Program incorporates "multimedia" in order to make it "student friendly" as students take assessments where they feel like they are playing a fast-paced computer game called "Right Stuff University." This format allows students to be self-regulated in their learning and motivated to learn. Motivation has been defined as an "internal state that activates, guides, and maintains behavior" (Green, 2002). This allows for the creation of construction of new knowledge from the student's prior knowledge foundation.

The learning theory of constructivism has evolved from the extensive study of cognitive development by Swiss psychologist Jean Piaget and the Russian psychologist Lev Vygotsky. In constructivist thinking, meaning is constantly evolving, and one's knowledge of a particular concept takes on new meanings every time it is applied in a new situation; therefore "it's critical that learning occur in realistic settings and that the selected learning tasks be relevant to the students' lived experiences" (Ertmer & Newby, 2013).

Focusing on preexisting knowledge and the unique backgrounds of each individual learner, constructivists believe that learners apply new knowledge to their own realities, and that therefore they will construct their own meaning from the knowledge being acquired (p.56). Constructivists believe that children develop knowledge through active participation in their learning. However, Piaget believed that cognitive development was a product of the mind "achieved through observation and experimentation, whereas, Vygotsky viewed it as a social process achieved through interaction with more knowledgeable members of the culture" (Rummel, 2008). Vygotsky's theory of learning assumes that both teaching and learning are highly shared and interactive activities by way of social interactions.

The constructivist theory states that the individual learner will use the new instruction to make connections with new content. In example, it is known that Vygotsky's (1978) *Zone of Proximal Development* (ZPD) postulates that the potential level of cognitive development a learner has is relative to the support they receive. ZPD is the difference between what a child can accomplish alone and what he or she can accomplish with the assistance of a more experienced individual. The assistance by the teacher is "scaffolding" and it can take many forms, such as, tutoring or differentiated instruction.

According to Gillani (2003) the works of E. L. Thorndike dominated educational practices in the United States for several decades. Thorndike's theory of learning has come to be known as *Connectionism* because he posited that learning was a process of forming a connection between stimulus and response. Thorndike applied his connectionism theory directly into educational planning. He developed two major laws of learning that are influenced by reward: *law of effect and law of exercise* (Gillani, 2003).

The "law of effect" simply states that when a connection is created by stimulus and response and is followed by reward, the connection is strengthened (Thorndike, 1913). The second important principle posited by Thorndike for educational purposes was the law of exercise which states the strength of a stimulus-response connection is directly proportional to the number of times it has been repeated. In other words, the more practice the stronger the connection between stimulus and response, and the less practice the weaker the connection between the stimulus and response (Gillani, 2003).

Connectionism was first introduced over one hundred years ago, however, it has re-emerged in the development of E-learning environments in today's digital age. The researchers Siemans and Downes (2009) developed a theory for the digital age, called *Connectionism* which denounces the boundaries of behaviorism, cognitivism, and constructivism. Their proposed learning theory has issued a debate over whether it is a learning theory or instructional theory or merely a pedagogical view (Duke, Harper, & Johnston, 2013). Stephen Downes describes connectionism as "the thesis that knowledge is distributed across a network of connections, and therefore that learning consists of the ability to construct and traverse those networks" (Downes, 2007, para.1).

The core skill is the ability to see connections between information sources to maintain that connection to facilitate continual learning (et al., Duke, 2013). Whereby, personal knowledge grows by the flow of knowledge through the technological connections individuals have created within a system of collective networks (Siemens, 2004). Hernandez (2012) posited that "third grade is an important pivot point in a child's education, the time when students shift form learning to read and begin reading to learn."

In sync with these theoretical frameworks is the Texas *SUCCESS* Initiative. The Texas SUCCESS program provides engaging and interactive online programs that support students at all skill levels, and most importantly, encourages and enables progress and achievement as students move through selected curriculum and activities. Hence, most researchers agree that the goal of comprehension is more likely to be attained when students are involved in seeking, organizing, and reformulating their own works (Reardon & Galindo, 2009).

Glossary of Terms

At-Risk: Refers to students who have failed their state-mandated tests or who are potentially in danger of failing those assessments due to their socio-economic status and low achievement. These students need special interventions to close their gaps in skill acquisition (Buffman, Mattos, & Weber, 2010).

Computer-Assisted Instruction (CAI): CAI is a specific application of technology in which a computer and a software program allows for the multimedia presentation of instructional materials and individualized instruction for student remediation (Kulik, 2003).

Computer-Based Instruction (CBI): Another name for computer-assisted instruction which evolved from the research in the cognitive theory of learning.

Constructivism: Constructivism is the premise that children and adults will actively construct their own knowledge, rather than simply absorbing ideas spoken to them by teachers (Fosnot, 2006).

Differentiated Instruction: Refers to the way a teacher anticipates and responds to a variety of student needs in the classroom. To meet student needs, teachers differentiate by modifying the content (what's being taught), the process (how it is taught), and the product (how students demonstrate their learning) (Echevarria, et al., 2008),

Effect Size: The effect size is a measure of the magnitude of an effect. Researchers use a standardized measure to facilitate the comparisons between outcomes and participants (Creswell, 2010).

Educational Technology: Defined as a variety of electronic tools and applications that help deliver learning content and support the learning process. Examples include computer-assisted instruction (CAI), integrated learning systems (ILS), and the use of video or embedded multimedia as components of reading instruction (Cheung & Slavin, 2012).

English Language Learner (ELL): Refers to an individual student who is a nonnative English speaker and is limited in English proficiency. Also, referred to as Limited English Proficient (LEP) students (Texas Education Agency, 2010).

Integrated Learning Systems (ILS): An adaptive sequence CAI software package that includes content individualized to a student's learning needs and as assessment system that provides feedback to the teacher regarding students' progress (Putman, 2014).

Intervention: An intervention is an educational program, product, practice, or policy aimed at improving student outcomes with additional instruction in the areas of academic need. It is strategy or method used to identify and treat academic difficulties, in order to prevent struggling learners from failing (Wright, 2007).

***Istation* (Multi-Media/Interactive Learning System):** *Istation* consists of four components: Assessments, Instruction, Teacher Tools, and Reports. *Istation's* computer-adaptive assessments, reading instruction, and support for intervention blend technology with Teacher-Directed Lessons. Teachers accomplish more while students learn at their own pace in the classroom as well as home (Mathes, 2011).

Limited English Proficient Students: Refers to a federal designation for students whose English proficiency is too limited to allow them to benefit fully from instruction in English. They are also called English Language Learners (Echevarria, 2008).

Literacy: Literacy is commonly thought of as the ability to decode and encode words on a page. Literacy is a plural construct because it involves multiple practices. From this perspective, literacy is context-free and value-neutral, located in the mind of individuals, and usually acquired in the first few years of school, mainly through the mastery of phonics (Warschauer, 2006).

Motivation: Motivation is the desire to do things. It is the crucial element in setting and attaining goals. Research shows you can influence your own levels of motivation and self-control. Self-efficacy affects some of the factors that predict motivation (Bandura, 1997).

Multimedia Learning: Multimedia learning is both technology-centered and learner-centered. The goal of multimedia is to provide access to information through presentations and to aid in human cognition through response strengthening, information acquisition, and knowledge construction (Mayer, 2012).

Multimodal Literacy: Refers to meaning-making that occurs at different levels through reading, viewing, understanding, responding to, producing and interacting with multimodal texts and multimodal communication (Kress & Jewitt, 2003).

Nonparametric Statistics: Techniques that do not have such stringent assumptions as parametric statistics (normally distributed scores) and more suitable for smaller samples (Salkind, 2014).

Parametric Statistics: Techniques that make a number of assumptions about the population from which the sample has been drawn (normally distributed scores) and code the data (ratio or interval level scaling) (Salkind, 2014).

Response to Intervention (RTI) Model: RTI is multi-tier approach to the early identification and support of students with learning and behavior needs. In Tier 1, the program is supplemental and is meant to enhance the core program for all students. In Tier 2, the program is used to prevent or remediate skill deficits for students who are somewhat below grade level. In Tier 3, the program is used intensively for students who are significantly below grade level (Texas Education Agency, 2009).

Scale Score: A single numeric score that shows overall performance on a standardized test. Typically, a raw score (number of questions answered correctly) is converted to a scale score according to the difficulty of the test and/or individual items. For example, the 200-800 scale score used for the SAT (Texas Education Agency, 2016).

Texas Student Using Curriculum Content to Ensure Sustained Success (SUCCESS): A program that provides state-funded access to interactive mathematics and reading programs for Texas public school students in grades 3rd to 8th (Texas Education Agency, 2012).

The State of Texas Assessments of Academic Readiness (STAAR): A series of state-mandated standardized tests used in Texas schools to assess students' performance and achievement in their grade level (3rd to 12th grades) (Texas Education Agency, 2012).

Title I: Federally funded program that provides additional funding to schools based on the ratios of children at or below the national poverty levels who are economically disadvantaged (Texas Education Agency, 2010).

Delimitations, Limitations, and Assumptions

This study was delimited to Hispanic at-risk reading students in fourth grade in only one South Texas school district with three participating elementary Title I school campuses. This study was conducted in a nine-month period from September 2016 to May 2017 with a small sample of 247 students. The student sample came from approximately nine different fourth-grade reading classrooms with nine different teachers and their paraprofessionals.

Limitations to the study consisted of the fact that there were no physical participants chosen by using the stratified random method or any other method. The researcher used “archival” data for this study. Another limitation to this study was the existence of external factors: factors such as student motivation, previous teachers, and learning styles could also influence reading levels and there is no way to account for all of these.

In addition, there is the potential for teacher bias during the implementation of the computer programs based on relationships with special students. Lastly, the researcher only studied the impact of one intervention program, *Istation* Advanced Reading Program and this affects the generalizability of the study to other school systems in the United States. However, generalizability of results to schools of populations with similar demographics could be attained with this study.

Overview of the Study

This study was organized into five chapters. Chapter One contains an introduction to the study, significance of the study, statement of the problem, research questions, definitions of terms, limitations and delimitations, and an overview of the study. Chapter Two provides a review of relevant literature in educational technology and CAI in reading. Chapter Three is an explanation of the methodology used to conduct the study and answers to the research questions. Chapter Four provides a description of the findings and the results of the data analyses. Chapter Five is composed of the summary of findings, conclusions, and recommendations for further research in response to this study. Limitations of this study will be discussed in this chapter along with suggestions for educators using CAI in their classrooms will be provided, and suggestions for future research examining the impact of CAI on reading outcomes will be presented, too.

CHAPTER II

REVIEW OF LITERATURE

Introduction

In an effort to provide interventions for students identified as struggling readers, schools are turning toward computer-assisted reading intervention programs to improve their literacy skills. Since the turn of the 20^{th} century, educators have used various types of technology aids to help them teach and to improve their students' learning (Heinich, Molenda, Russell, Smaldino, 2001). As teachers continually strive to improve the learning outcomes for all students in a positive way, research, pedagogy and practice in literacy education has required them to become architects of change, rethinking how best to use multiliteracies and technology to support teaching (as cited by Marion Piper, for e-Technology, 2016).

One literature review provided by Warschauer and Matuchniak (2010) summarized very directly the typical uses of technology in relation to the different learner populations, noting that "drill and practice activities favored in low-SES schools tend to be ineffective, whereas the uses of technology disproportionately used in high-SES schools achieve positive results." Researchers have begun to collect some useful knowledge about the successful use of technology to support students who are often placed at-risk of school failure, to help them close skill gaps, strengthen their understanding and recoup prior experiences of failure (Alliance for Excellent Education, 2014). Furthermore, this research has found that using computers as replacements for teachers in traditional drill-and-practice exercises has not produced greater success for the at-risk students, but that more interactive, proactive, and teacher-supported uses have helped students make strong strides in achievement (Alliance for Excellent Education, 2014).

In order, to meet the struggling students' needs, many schools have incorporated intense intervention programs, differentiated instruction, and have turned to technology-embedded programs that help students stay engaged and motivated to learn their reading skills (Slavin, Lake, Davis, Madden, 2009). The advancement of educational technologies, especially computer technologies has brought significant changes in our educational systems, with computers playing a more important role in teaching and learning (Gulek, 2005).

Educational technology is becoming increasingly important for improving instructional practices, curriculum, student achievement, and standardized testing (National Research Council, 2002). These technologies have become part of the interventions within the scope of the concept of instructional differentiation. Differentiated instruction is essential in creating proficient readers. Differentiation was derived from the progressive movement among educators and the progressivist, John Dewey. Dewey believed that curriculum should be student-centered and at the students' present capacity levels (Parsons, Dodman, & Burrowbridge, 2013).

Technology is becoming increasingly important in improving practices (curriculum) and students' achievement (standardized testing). Because technology is a dynamic, adaptable, and persistently evolving tool, and the instructional applications it supports also continually evolve and change, the range of research studies involving the use of technology as a critical component of literacy instruction is increasing (Burnett, 2010).

Digital tools such as computers, tablets, and smart phones introduce modes and genres of reading, writing, and communicating referred to as *new literacies* (Coiro, Knobel, Lankshear, &

Leu, 2008). According to Smith and Woody (2000) research suggests that those using a multimedia approach in instruction are perceived favorably by students. This approach produces some significant improvements in student learning as proven by both student self-report and objective outcome testing The advancement of educational technologies, especially the computer technologies has brought significant changes in our educational systems, with computers playing a more important role in teaching and learning (Gulek, 2005). These new technologies offer new learning strategies for students who do not perform as well using traditional instructional methods. These technologies are a good fit for our students have grown up in a "highly technological" environment. As a result, they are very skilled with the use of computers, I-Pads, multimedia, and the Internet. This new generation of learners are labeled as "digital natives."

Hill (2005) recognizes that the increasing engagement with multimodal literacies changes the way children think and learn (p.382). As part of literacy planning and management, opportunities need to be scaffolded for children through a balance of traditional and new media giving serious thought to the context of reading improvements for struggling students. A recent meta-analysis of 84 rigorous studies compares the impact of various technologies (computer-managed learning, innovative technology applications, supplemental technology, and comprehensive models) on K-12 reading achievement.

According to Cheung and Slavin (2012) comprehensive models that integrate computer-assisted instruction with other activities such as a core-reading program appear to produce the largest improvements in reading scores. In addition, the use of multimedia in education has significantly changed people's learning processes. Results from a number of research studies indicate that appropriately designed multimedia instruction enhances students' learning performance in science, mathematics, and literacy (Gee, 2003). With computer-assisted instruction (CAI) and computer-based learning (CBI), instructors can provide different ways of learning besides traditional learning methods.

In 2012, Cheung and Slavin expanded their investigations of the effects of technology on the outcomes of struggling readers in a non-peer-reviewed study found in the Best Evidence Encyclopedia (BEE). In this synthesis, the authors included studies of educational technology (ET), defined as electronic tools to deliver learning content and support the learning process. Four types of ET were categorized: (a) traditional, supplemental CAI (e.g., drill-and-practice, self-tutorial materials); comprehensive models (e.g., CAI alongside core reading practices; *Read 180*; (c) small-group integrated models (e.g., *Lindamood Phoneme Sequence*); and Fast Forward Word (FFW). Only supplemental programs and FFW were considered CAI. The effect size for supplemental programs was the only category demonstrating a mean effect slightly significantly different from zero. Results indicated that technology may be more effective for younger students (k-3; ES = +0.36; k = 8) than older students (4-6; ES = +0.07; k = 10).

One of the most compelling findings from several recent longitudinal studies in reading research is that children who get off to a poor start rarely catch up and remain mired in a cycle of reading failure (Torgesen, 2004). He goes on to state: “that the good news is we now have tools to reliably identify the children who are likely destined for this early reading failure.” There are now, more than ever more specific examples, of our ability to interrupt this cycle for poor readers (Torgesen, 2004). This is due to changes in education practices resulting from No Child Left Behind (NCLB, 2001).

According to researchers Wansek, Wexler, Vaughn & Ciullo (2009) there has been considerable research conducted over the past three decades that provides extensive knowledge regarding early intervention for young readers with reading difficulties (Blachman et al., 2004;

Fletcher, Lyon, Fuchs & Barnes, 2007; Lovett et al., 2000; and Mathes et al., 2005). These reports indicate that the highest student effects result when explicit, systematic instruction are provided in both foundation skills such as phonological awareness and phonics as well as higher level reading tasks, such as fluency, with increased attention to word meaning and understanding text (National Reading Panel, 2000).

Torgesen (2000) further extrapolates that incorporating these elements of instruction has been associated with reducing the incident of reading difficulties. The focus of many studies is on older struggling readers in Grades 4 to 12 whose reading ability is below the normative expectations. Historically, students in this age group were the first to be targeted for intervention (NAEP, 2013). Today, interventions aimed at helping readers in Grades 4 to 12 remain critical to efforts to improve reading proficiency nationwide.

The 2013 National Assessment of Educational Progress (NAEP) reading assessment determined that 65 % of fourth graders and 64 % of eighth graders were not proficient readers. These statistics improved little from the previous decades, with the 2003 NAEP reading assessment showing that 69 % of fourth graders and 69 % of eighth graders scored below the proficient level, and the 1992 NAEP reading assessment, where 72 % of fourth graders and 71 % of eighth graders scored below proficient levels. With the technological and methodological advances of today, new opportunities are now available for the 21st Century reading research interventionists.

Legislative History

In the United States, many English Language Learners (ELLs) lag behind their native-English speaking peers in their educational achievement. The Texas Education Agency (TEA) reports that when compared to English-speaking students, ELL students have lower reading and math test scores, academic grades, and educational aspirations (TEA, 2014).

The passage of No Child Left-Behind Act of 2001, placed heavy emphasis on outcomes for all students, requiring school districts to adopt evidence-based teaching methods and interventions (U.S. Department of Education, 2005). Public schools are required to adopt instructional programs and approaches in order to help meet the needs of struggling learners, which include at-risk, special education, and bilingual students or English Language Learners (ELLs).

In 2001, the United States Congress enacted the No Child Left-Behind Act, which provided billions of dollars to improve reading instruction in grades K-3. This law mandated that every child should be reading on grade level by the end of the third grade. Furthermore, with a few more provisions that were added to NCLB (2001), "all general and special education students in grades three through eight, who attend public schools were to be assessed every year in reading and math, and they were required to demonstrate mastery of grade level knowledge and skills as determined by the state education agencies "(U.S. Department of Education, 2013).

In Texas, educators are accountable to the Texas Education Agency (TEA). Students' scores are expected to improve every year according to a predetermined annual yearly rate of progress (AYP). According to Hall and Mahoney (2013) test scores are disaggregated and weighed differently according to subpopulations which include English Language Learners (ELLs), students with learning disabilities, minority students, and low-socio-economic status. These students are identified as "at-risk" students. State and federal funding are available to help schools that serve high populations of these "at-risk" students (Hall & Mahoney, 2013).

According to Rumberger (2007), educators test our students before they are ready or proficient in the English language which increases the learning gap for the English Language Learner (ELL). Our Spanish-speaking students enter Kindergarten with a gap in language and math skills compared to English-only students. In some states, this gap widens as they progress to grade five. In others, it narrows, but non-English speakers do not come close to catching up (Reardon & Galindo, 2009).

On the National Assessment for Educational Progress exams for reading in 2009, English learners performed poorly at fourth and eighth grade. Seventy-one percent of English learners in fourth grade scored “Below Basic,” but only 24% of non-English learners did. Further, only 6% of English learners performed at Proficient or Advanced levels, while 34% of non-English learners reached those higher levels (Echevarria & Vogt, 2011).

A strong advocate for students, Allington (2011) stated, “that although the United States Congress can share the blame for creating the education we now see in almost every U.S. school. We should also recognize that Congress in 2004 provided educators with an option that just might help us undo some of the mistakes of the past and close the current reading achievement gap: the Response to Intervention (RTI) Initiative.”

Response to Intervention (RTI) is a nationally recognized educational reform effort designed to improve teaching and learning for all students in U.S. schools (Wixson, 2011). According to the National Center for Response to Intervention (2014) RTI was written to identify and support students who are at risk of failing, the RTI program is intended to: (a) ensure high-quality classroom instruction and, (b) provide additional interventions to students who need it. Smith and Okolo (2010) agreed that educators are seeking ways to further the integration of technology tools within the framework of RTI, thereby, strengthening the RTI model with the use of technology, seen as a tool support and enhance learning for struggling students.

The RTI Model in Texas

In the push for improved student performance in reading, schools have moved toward the use of the Response to Intervention model (RTI). This three-tiered system is designed to monitor and support all students, with particular intervention emphasis on students identified as struggling in reading (Texas Education Agency, 2008).

Response to Intervention was designed as a pro-active process to reduce the number of student referrals by: (a) ensuring that teachers provide evidence-based classroom instruction that is differentiated to meet students' needs, (b) identifying students with learning gaps using a universal screening process, (c) providing relevant direct instruction to close learning gaps, and (d) monitoring students' progress (Fuchs, Fuchs, & Compton, 2012).

According to researchers, the following components are important to the implementation of RTI: (a) at-risk students are identified and monitored; and (b) instruction is multi-tiered, so that instruction intensifies as students move from one tier to another (Fuchs & Fuchs, 2006; Hughes & Dexter, 2011). Teachers are the most important components of the RTI process and they have to implement the NCLB's research-based practices in the classroom. Teachers are expected to change from traditional teaching methods that focus on instruction to analyzing data to ensure that all students are successful (Hughes & Dexter, 2011).

Rather than focusing on student deficits, teachers have to take on the responsibility for the success or failure of struggling students by identifying and filling students' learning gaps

(Sanger, Friedli, Brunken, Snow, and Ritzman, 2012). In order for RTI to work well, the following essential components must be implemented:

1. High-quality, scientifically based classroom instruction.
2. Ongoing student assessment.
3. Tiered instruction
4. Strong parental support.

Parents need to be provided with information about their child's progress, interventions used, staff members delivering the instruction, and the academic goal or plan for their child. Thus, RTI is intended to improve learning for all students, both in the general education classroom and by providing individuals with additional interventions (Federal Budget Project, 2014).

According to the *Istation* Technical Manual information (2014), *Istation* complements RTI by prescribing the appropriate differentiated instruction (through *Istation* Priority Reports) and it goes even further by maintaining an audit trail of all prescribed lessons and allows teachers to document when those lessons were delivered. This document is critical when the instructional committee needs to determine whether instructional plans and interventions are working or what adjustments may be needed.

Lastly, *Istation* is perfectly aligned with the Three-Tier RTI Model with its robust assessment technology, comprehensive reports, dynamic curriculum, and vast library of support. The *Istation* curriculum is part of the pyramid of RTI support which serves as differentiated instruction for those identified with learning gaps and deficits. The program is differentiated to individual students and adjusts to each student's needs as he or she progresses through the program. The *Istation* interface allows for students to remain engaged, interactive, and responsive when working and reading in the program (Mathes, 2014).

Pyramid of RTI Support

The RTI process is a continuum of levels, or tiers, that vary in intensity according to students' needs. The RTI framework is represented, as a 3-tiered triangle. For example, 80% of students should respond to the evidence-based, differentiated instruction provided in a general education classroom (Tier 1). Tier 1 is the core classroom instruction where highly qualified teachers use scientifically research-based practices such as daily small-group instruction and differentiation to meet the needs of all students (Abbot & Willis, 2012). Usually only five percent of students in any given classroom should need intensive 1:1 direct instruction that could lead to identification of specific learning disabilities (SLDs) through special education testing.

Students identified as needing additional instruction in specific areas of skills move up the continuum to receive additional instruction until their learning gaps or deficits have been filled. Students who demonstrate proficiency in knowledge or skills after receiving interventions have "responded to the intervention," and move back down the continuum (Johnson, 2015).

In Tier 1, student progress is continually monitored, using universal screenings (3 times per year): at the beginning of the school year (BOY); at the middle of the school year (MOY); and at the end of the year (EOY). Furthermore, ongoing formative assessments such as weekly and monthly quizzes are used to ensure that all students are challenged at their current ability levels. Students who are unable to demonstrate mastery of skills at a level determined by the district (cut points) may need more direct instruction in the classroom to fill the learning gaps (Hall & Mahoney, 2013).

According to Johnson (2015), approximately 15% of all students in any school may have difficulty learning in a general education classroom due to lack of language, socio-economic disadvantages, cultural differences, or specific learning disabilities (SLDs). Tier 2 instruction targets the learning gaps identified by the universal screenings, formative assessments, and teacher observations on Tier 1.

Additional targeted instruction (interventions) provided by a support teacher or specialist while last for periods of 8 to 12 weeks. On Tier 2, progress is monitored frequently to show if and how students are "responding to the intervention." Students who demonstrate mastery of the targeted skills and "responded" to Tier 2 interventions move back down the RTI continuum and continue Tier 1 classroom instruction. Students who do not respond may participate in another Tier 2 cycle or move on to receive even more intense support (Cicek, 2012).

Usually, students who do not respond to one or more cycles of targeted Tier 2 interventions combined with Tier 1 classroom instruction may need the intensive support provided by Tier 3 interventions (Abbot & Willis, 2012). Only 5% of all students in any school should need Tier 3 instruction (Johnson, 2015). Tier 3 interventions are taught in addition to core classroom instruction, however, on Tier 3 students work individually with a highly skilled interventionist to receive intensive, direct, and systematic instruction. Tier 3 intervention cycles can be of long duration as determined by the campus RTI committee. Finally, data collected during Tier 3 interventions is added to Tier 2 and Tier 1 data to help determine if special education testing is needed (Johnson, 2015).

Educational Technology

Although research reviews on reading interventions for struggling readers have been abundant, none of these reviews focused on the use of educational technology applications to enhance reading achievement for struggling readers (Cheung & Slavin, 2013). However, there seems to be a universal agreement that a major aspect of technological implementation in schools should be whether such applications actually do improve teaching and learning and increase student achievement (Southern Regional Board, 2002; U. S. Department of Education 2002). Selected research studies indicate that technology can be effective in teaching basic skills, and that computer-assisted instruction can significantly improve scores on standardized tests.

Cheung and Slavin (2012a) define Educational technology (ET) as a “variety of electronic tools and applications that help deliver learning content and support the learning process.” ET represents the broad use of technology in the learning environment. ET can include both CAI and Assistive Technology (AT), as well as interactive whiteboards, LCD projectors, video-based instruction and the Internet. The main distinction between ET and CAI in this study is that ET can be used to enhance teacher-led instruction (whole-class instruction using videos), whereas CAI relies exclusively on application-led instruction provided to individuals or pairs of students.

Fouts (2000) indicated that, while not all reviews of research on computers and instruction show outcomes in favor of computer use, the majority reach positive conclusions about their efficacy. He reports this generalization on computers and education:

- When combined with traditional instruction, the use of computers can increase student learning in the traditional curriculum and basic skills areas.

- The integration of computers with traditional instruction produces higher academic achievement in a variety of subject areas than did traditional instruction alone.
- Students learn more quickly and with greater retention when learning with the aid of computers.
- Students liked learning with computers and their attitudes toward learning and school were positively affected by computer use.
- The use of computers appears most promising for low achieving and at-risk students.
- Effective and adequate teacher training is an integral element of successful learning programs based on or assisted by technology.

Educational technology can be defined in many different ways and many scholars have provided various definitions, however, the most comprehensive definition of "educational technology" has come from the researchers Seels and Richey (1994) who wrote: "educational technology is the theory and practice of design, development, utilization, management, and evaluation of processes and resources for learning" (Ramadan & Yaratan, 2014).

According to Israel, Marino, Delisio, and Serianni (2014), the administration of President Obama, released the "Elementary and Secondary Education Reauthorization Blueprint for Reform" in 2010. This statement calls for the increased use of technology to enhance accessibility of academic content specific to instruction and assessment, it has been included in nearly every federal education policy initiative developed by the United States Department of Education.

The National Education Technology Plan (NETP) states, that "the challenge for our educational system is to leverage the learning sciences and modern technology to create engaging, relevant, and personalized learning experiences for all learners that mirror students' daily lives and the reality of their futures" (U. S. Department of Education, 2010).

Smith and Okolo (2010) stated that the necessary connections students must make among concepts and key terms can be solidified through multimedia components embedded within software and Internet-based technology-based solutions. Mayer (2009) defined multimedia technology as the digital integration of text, graphics, video, audio, animation, or any other media and the representation, storing, and transmitting of digital information, which can greatly augment existing approaches for the remediation of skills.

When advances in technology are used effectively in the classroom, English Language Learners can reap many benefits. For example, digital content is motivating for students, allows for a personalized learning experience, is multimodal, and can give students experience with meaningful and authentic tasks (Lemke & Coughlin, 2009). For all developing readers, computer-assisted instruction that is research-based and tailored to each student has significant potential to accelerate the learning process (Torgesen, 2004). Thus, the challenge is to ensure that technology is used to enable, or make more efficient, effective teaching and learning practices.

Benefits of Technology in the Classroom

Children who struggle with reading in any grade can benefit from interventions targeting specific reading skill deficits. An instructional solution such as CAI may ensure that more students receive individualized targeting interventions used as supplemental resources to core literacy. Moreno and Mayer (2007) defined CAI as being "interactive multimodal learning environments" which consist of a two-way interaction between the learner and the learning environment (i.e., computer or I-Pad) integrated in core literacy. Computer-assisted instruction is defined as a specific application of technology in which a computer program allows for the dynamic presentation of instructional material and individualized instruction.

Warschauer and Meskill (2000) argue that the use of technology in the classroom can afford ELLs with multiple opportunities for the development of language. Effectively applied, language learning activities integrated with technology can provide students with authentic opportunities for the negotiation of meaning, a key principle in second language acquisition (Warschauer & Meskill, 2000). The research literature indicates the importance of providing ELLs with access to technologies that maximize their ability to interact in “meaning-rich contexts” which maximize their acquisition of a second language. The advancement of educational technologies, especially computer technologies has brought significant changes in our educational systems, with computers playing a more important role in teaching and learning (Gulek, 2005).

Technology is becoming increasingly important in improving practices (curriculum) and student achievement (standardized testing). For example, computer-assisted instruction (CAI) offers students an opportunity to be actively engaged in the learning process, to receive instruction through a variety of multimedia, to choose when and where they learn, to work at their own pace, and to receive immediate and accurate feedback (Brown, 2005). Technology can be used very effectively as a short but focused intervention to improve learning, especially when there is regular and frequent use (about three times per week) over a course of five to ten weeks (Cheung & Slavin, 2011).

In previous studies, Slavin (1997) stated that one means of individualizing instruction is through computer-based instruction (CBI). Slavin argued that the idea behind computer-based instruction is to use the computer as a tutor to present information, give students practice, assess their level of understanding, and provide additional instruction if needed. Furthermore, a well-designed CBI program can analyze students' responses immediately to determine whether to spend more time on a particular topic or skill (Slavin, 1997).

The computer can be quite effective in presenting ideas, using pictures or diagrams to reinforce concepts. For many students the computer seems to have a motivating quality so that they work longer and harder as compared to paper-and-pencil tasks (Slavin, 1997). Thus, remedial and tutorial use of technology can be particularly effective for lower performing students (Lou et al. 2001) or those with special educational needs (Li & Ma, 2010) or those from disadvantaged backgrounds in providing intensive support to enable them to catch up with their peers (Cheung & Slavin, 2011).

John Kulik (2003) has studied the meta-analysis of more than 500 individual research studies in CAI. Computer-assisted instruction individualizes the educational process to accommodate the needs, interests, technical inclinations, current knowledge, and learning styles of the student. CAI instruction software consists of tutorial, drill and practice, and more recently Integrated Learning Systems (ILS). As such, there were three positive findings from Kulik's work (1994; 2003):

(1) the results that students who used CAI scored at the 64th percentile on achievement tests compared to students in the control conditions without computers who scored at the 50th percentile;
(2) students learn more in less time when they receive CAI;
(3) students like their classes more and develop more positive attitudes when their classes include CAI.

Chuang and Chen (2009) also studied the use of computer technology for instructional purposes. Using an experimental design, they examined the merits of CAI as compared with computer-based video games designed to promote learning. They discovered that the video game produced better results than the CAI activities in the areas of recall, strategic skills, problem solving, and higher order cognitive processes. Collier (2004) also stated that instruction supplemented by properly designed CAI is more effective than instruction that is not.

Computer-assisted instruction can play an important role in classrooms and science laboratories, not as a substitute for other activities, but as an additional tool. Computers can be used for text and test readings, games, tutorials, drill and practice, and simulations of science experiments (Collier, 2004). Thus, computers are labeled as supplementary learning tools for all purposes intended. Research suggests that educational technology is most effective when used to enhance constructivist or student-centered instructional strategies (U.S. Department of Educational Research and Improvement, 1992). As cited by Kristina Ford and Leslie Lott in their essay, *The Impact of Technology on Constructivist Pedagogies*, early roots of constructivism are from theories of John Dewey and Jean Piaget (Brown and Green, 2006).

According to Ford and Lott (2010) Dewey set the foundation for constructivism by finding inquiry to be part of learning and Piaget's theories helped to shape constructivism with the key concepts of assimilation, accommodation, and schema. Computer-assisted instruction has been studied for its effect on lower achieving students for the past 25 years (U.S. Department of Education, 2009). The effectiveness has been attributed in part to its being non-judgmental and motivational, while giving immediate and frequent feedback; individualized learning to meet student needs, allowing for more student autonomy, and providing multi-sensory components (Barley et al., 2002, p. 97).

In summary, the usage of technology for the improvement of educational programs is not new. In researched interventions, technology is best when used as a supplement to the curriculum rather than a replacement for it (Kulik, 2003).

Constructivism

New interventions allow students to have more control over their own learning, to think analytically and critically, and to work collaboratively. This "constructivist" approach is one effort in educational reform made easier by interventions. Research shows that integrating interventions into instruction tends to move classrooms from teacher-dominated to student-centered learning environments (Pitler, Hubbell & Kuhn, 2012). Furthermore, they state that technology allows teachers to differentiate instruction more efficiently by providing a wider variety of avenues for learning that reach all learning styles.

According to the authors of *Meaningful Learning with Technology*, in order for students to learn meaningfully, they must be willfully engaged in a meaningful task (Howland et al., 2012). In their book, they explain that in order for meaningful learning to occur, learning technologies can be any environment or definable set of activities that engage learners in active constructive, intentional, authentic, and cooperative learning (Howland et al). Reading programs were viewed through the cognitive lens, too.

Constructivism refers to learning as the construction of new meaning (knowledge) by the learner by himself or herself (Brown, 2005). Brown states "that computer-assisted instruction offers students an opportunity to receive instruction through a variety of multimedia, to choose when and where they learn, to work at their own pace, and to receive immediate and accurate feedback." This immediate feedback increases students' intrinsic motivation. Furthermore, the constructivist theory states that the individual learner will use the new instruction to make connections with the new content.

Vygotsky's (1978), *Zone of Proximal Development* (ZPD) postulates that the potential level of cognitive development a learner has is relative to the support he or she receives. The ZPD is the difference between what a child can accomplish alone and what he or she can accomplish with the assistance of a more experienced individual. The assistance provided by the teacher is scaffolding and it can take many forms, such as, tutoring or differentiated instruction. Scaffolding is the process that supports individual efforts through the structuring of interactions and the breakdown of instruction into steps that are manageable by the student in response to their level of performance (Brown & Green, 2006).

One foundational premise of constructivism is that children actively construct their own knowledge, rather than simply absorbing ideas spoken to them by teachers (Fosnot, 2006). According to Meece (2002), the zone of proximal development (ZPD) is the difference between what children can do on their own versus what they can do with assistance from others. Interactions with adults and peers in the ZPD promote cognitive development. The ZPD represents the amount of learning possible by a student given the proper instructional conditions (Puntambekar & Hubscher, 2005). The constructivists viewed learning as a search for meaning.

Piaget and Vygotsky described elements that helped predict what children understand at different stages (Rummel, 2008). It was Lev Vygotsky that conceptualized the idea of the zone of proximal development (ZPD) which theorized that the way a child performed was based on what the child could do independently as opposed to what a child could do with assistance (Vygotsky, 1978).

Technical scaffolding is a new approach in which computers replace the teacher as the experts or guides, and students can be guided with web links, online tutorials, or help pages (Yelland & Masters, 2007). In addition, educational software can help students follow a clear structure and allows students to plan properly (Lai & Law, 2006). Thus, the learner emerges with a sense of accomplishment which elevates his or her self-confidence and motivation.

Student Motivation

Students must read with sufficient fluency to maintain motivation and efficiency and not lose comprehension because of slow reading (O'Conner, Swanson, & Geraghty, 2010). Technology has often been proposed as a solution for the needs of struggling readers (Stetter & Hughes, 2013). In theory, computers can adapt to the individual needs of struggling readers, building on what they can do and filling in gaps. Computers are clearly motivating for most students and they can mimic some of the behaviors of expert human tutors (Lever-Duffy & McDonald, 2008).

Motivation is a construct that can only be inferred and not directly observed. The researchers Pintrich and Schunk (1996) list a number of research paradigms, including correlational, experimental, qualitative, laboratory, and field; and also a variety of motivation indexes, which include choice of tasks, effort, persistence, and achievement. Computer-based instruction can support other learning activities.

Software that gives immediate positive feedback can provide motivation and focus for students with learning disabilities (Fuchs, 2012). According to the ACT Policy Report (2004) numerous reviews have concurred that:

> “Students learn more quickly and with greater retention when learning with the aid of computers. Students like learning with computers and their attitudes toward learning and school are positively affected by computer use. The use of computers appears most promising for low achieving and at-risk students. The integration of computers with traditional instruction produces higher academic achievement in a variety of subject areas than does traditional instruction alone.”

How can we assess students’ motivation toward learning with computers? Self-reporting questionnaires are the most common method to assess motivation in teachers and students.

Literacy Challenges

According to Slavin et al. (2010) every educator, parent, and policy maker knows the critical importance of reading in the elementary grades. More importantly, the gap in reading performance between ethnic groups, and between middle class and disadvantaged children, is perhaps the most important policy issue in the United States. Furthermore, because of the obvious importance of success in reading, schools invest enormous amounts of money in initial teaching of reading and in remedial services for struggling readers (Slavin et al. 2010).

Findings from the National Reading Panel (2000) indicate that some instructional methods for teaching reading are more effective than others and that many of the more effective methods are ready for implementation in the classroom. The Panel found that many learning difficulties to read are caused by inadequate phonemic awareness and that systematic and explicit instruction in phonemic awareness directly caused improvements in children’s reading and spelling skills.

Also, when students are using technology as a tool or support for performing authentic tasks, the students are in the position of defining their goals, making decisions, and evaluating their progress (Ed-Reform Studies, 2016). In another national reading report, according to Diane August and Timothy Shanahan from the New York Literacy Panel (2008), reading instruction for second language learners has become quite complex because students use multiple cognitive processes in reading.

Over the years, the focus of reading instruction has changed, shifting from decoding, to fluency, and recently to comprehension and word meanings. However, reading entails more than decoding or fluency or comprehension. It makes use of multiple skills: oral proficiency, phonological processing, working memory, word-level skills (decoding and spelling), and text-level skills, such as scanning, skimming, summarizing, and making inferences (August & Shanahan, 2008)

Second Language Acquisition

In the late 1990's, the National Reading Panel reviewed studies of reading instruction to access the effectiveness of different approaches. The resulting report identified five areas of instruction essential to an effective reading program: phonemic awareness, phonics, fluency, vocabulary, and comprehension (NICHD, 2000). Comprehension becomes especially important to students in the later elementary grades (Sweet & Snow, 2003) because it provides the foundation for further learning in secondary school. A student's academic progress is greatly shaped by the ability to understand what is read.

There is a growing demand for strong literacy skills. Literacy development is not just decoding and summarizing anymore. Academic or explicit vocabulary instruction entails frequent exposure to a word in multiple forms; ensuring understanding of meaning; providing examples, of its use in phrases, idioms, and usual contexts; ensuring proper pronunciation; spelling; and word parts; and when possible, teaching its cognates in the child's primary language (Murnane, Sawhill, & Snow, 2012).

Reading expands a child's vocabulary and writing skills, promotes social and emotional development, enhances attention span, improves memory, and increases creative and critical thinking skills in school (Lane & Wright, 2007). According to Calderon, Slavin, and Sanchez (2011), in the 1974 Supreme Court case, *Lau v. Nichols, 414 U.S. 563*, all public schools must take the necessary steps to assist all students in overcoming language barriers, in order to meaningfully and actively participate in their school instructional programs. Even though the federal government mandated all school districts to provide services for English language learners, it did not provide any guidance or policies for states to assess, identify, place or instruct these children (et al Calderon).

English Language Learners, including both immigrant and students born in the United States, may lack the academic language and key vocabulary necessary for understanding content information (August & Shanahan, 2010; Donnelly & Roe, 2010). Therefore, struggling readers require a multi-sensory approach to reading instruction.

English language learners must develop literacy skills for each content area in their second language as they simultaneously learn, comprehend, and apply content area concepts through their second language (Garcia & Godina, 2004; Short & Fitzsimmons, 2007). Moreover, English learners must master academic English which includes semantic and syntactic knowledge along with functional language use. Academic language is used by all students in school settings, both native English speakers and English learners alike (Cummins, 2000).

Krashen's (1994) theory of second language acquisition (SLA) states that a language is acquired when the comprehensible input in the second language is understandable to the learner and just outside the current realm of their linguistic abilities (Ariza & Hancock, 2003). According to Schutz (2014) Krashen's fifth hypothesis, the "affective filter" hypothesis, embodies Krashen's view that a number of affective variables play a facilitative, but non-causal, role in second language acquisition. These variables include: motivation, self-confidence, and anxiety.

Krashen claims that learners with high motivation, self-confidence, a good self-image, and a low level of anxiety are better equipped for success in second language acquisition. Low motivation, low self-esteem, and debilitating anxiety can combine to raise the affective filter and form a mental block that impedes comprehensible input from being used for language acquisition. Krashen's SLA theory is similar to Vygotsky's Zone of Proximal Development (ZPD) because the second language acquisition resembles the scaffolded learning process (Ariza & Hancock, 2003). Furthermore, Vygotsky's (1978) work highlights the fact that culture defines what skills and knowledge children to acquire and provides them with tools such as language, technology, and strategies to properly function within that culture (Miller, 2011).

The use of technology in the classroom can afford the English Language Learners (ELLs) with multiple opportunities for the development of language and building text comprehension. Text comprehension can be thought of as the interaction of reader and text. That is, the reader must construct meaning by interpreting information presented in the reading passage through the lens of their own prior knowledge of the topic or events that make up the content of that passage (National Reading Panel, 2000).

The research literature indicates the importance of providing ELLs with access to technologies that maximize their ability to interact in “meaning-rich-contexts” which enhances their acquisition of second language (Warschauer & Meskill, 2000). Taking a look at earlier, taxonomies of computers and computer-based education or CBE, the uses of computers in schools are very significant. Taylor (1980) stated that the computer presents material, evaluates student responses, determines what to present next, and keeps records of student progress. He added that a computer functions likes a “tool” and it acts (or mirrors) like a “tutor.”

Another significant advantage of CAI over more traditional formats, such as paper and pencil, is that the computer can automate routine tasks, removing these potential distractions and allowing students to focus on more-higher-order concepts (Patton, 2002). According to Chen (2005) both regular classroom teachers and ESL teachers affirmed that appropriate computer software packages helped ESL students to learn and effectively use the English language.

Many researchers have noted that language anxiety can affect second language learners’ success and motivation. Hutchinson (2009) stated that “some students with lower levels of anxiety show greater aptitudes for native and second-language learning.” Santos and Bishop (2010) argue that many American children continue to struggle with fundamental literacy skills, whereby, reading research has shown that children who get off to a poor start in reading often do not catch up to their peers.

Liu, Moore, Graham, and Lee (2003) state that there is a considerable amount of literature that explores the potential of technology with regards to more effectively teaching and learning of languages. Accordingly, Voogt and McKenney (2007) suggest that language development is not inhibited when young children use computers because interactive software packages can extend vocabulary and have positive effects on reading and spelling.

Reliably measuring the literacy skills of English learner students can be challenging. One solution is to administer a computer-adaptive assessment of literacy skills with enough items to measure growth. Hence, in a computer-adaptive assessment the selection, order, and number of items administered depend on a student's ability at the time of assessment. Students receive harder or easier items based on their performance, and the system stops administering items once it has enough information about the student's ability. As a result, adaptive assessments maximize precision of information while minimizing time spent gaining it (Mitchell, Truckenmiller, & Petscher, 2015). By targeting a student's performance level, adaptive assessments are particularly valuable for English learner students. The *Istation* Reading Program is a computer-adaptive assessment system that helps students become more fluent at their own pace.

***Istation*: The Reading Program and ISIP**

The *Istation* Advanced Reading Program is a unique interactive reading intervention program for at-risk and ELL students that individualizes instruction for each child which incorporates the Instructional Tier Goals. Consistent with other reading assessments, Istation offers a three-tier normative grouping based on indices associated with the 20th and 40th percentiles. Students with an index above the 40th percentile for their grade are placed in Tier 1. Students with an index below the 20th percentile are placed into Tier 3. These tiers are used to guide educators in determining the level of instruction for each student. Students are classified as:

- Tier 1 (40th percentile and above) are on track and performing at grade level.
- Tier 2 (between 21st and 39th percentile) are at some risk, are performing moderately below grade level, and are in need of intervention.

- Tier 3 (20the percentile and below) are at risk, are performing seriously below grade level, and are in need of intensive intervention.

The *Istation* is based on "best practices," and teaches children all of the skills required to become a fluent reader, at their own pace, and provides ongoing assessments that enable the teacher to better organize instruction. The program does this by delivering instruction that models what a teacher would do if they could work one on one with a child. It is a computer-based supplemental and intervention reading program that helps teachers teach students from kindergarten through eighth grades to read more fluently with improved comprehension (*Istation*, 2015).

Istation provides the online interactive reading software program which includes engaging, interactive content in a game-like format. The program is designed to support students at all skill levels, and, it encourages and enables progress and achievement as the students move through the interactive activities and curriculum. *Istation,* known for its accurate assessments, engaging curriculum, and trusted teacher tools helps students achieve academic growth. The program is a computer-based learning system that gives students access to individualized reading and comprehension instruction (*Istation*, 2015). It is called an interactive online platform for learning which improves the learning of children by engaging them with visuals, stories, and vocabulary to increase their reading abilities and word recognition. Lessons are scaffolded and given in research-based proven format. The *Istation* Advanced Reading Program provides systematic and explicit modeling and instruction to guide students through their individual learning paths based on assessments embedded in the program (*Istation*, 2015).

According to Sandra K. Thomas, President and Chief Operating Officer of *Istation*, the *Istation* Reading Program is a unique interactive reading intervention program for at-risk and

ESL students that individualizes instruction for each child. Based on “best practices”, it teaches children all of the skills required to become fluent readers, at their own pace, and provides ongoing assessments that enable the teacher to better organize group instruction. As children interact with the lessons in *Istation*, they are constantly monitored and assessed by the system (*Istation*, 2015). Furthermore, the Gibson Consulting Group (2014) defines the *Istation* program as a supplemental reading program that provides computer-adaptive instruction in an animated environment that is designed to improve phonemic awareness, alphabetic knowledge, vocabulary, and reading comprehension.

Istation was offered free-of-charge to all Texas public school students in Grades 3-8 as part of the Texas SUCCESS program. In 2013-14, the vast majority (87%) of students in grades 3-8 across the state were registered to use the *Istation* system; however, just over half (55%) actually logged into an *Istation* curriculum session. Furthermore, *Istation* Reading is a comprehensive computer-based reading and intervention program that maximizes students’ reading fluency, vocabulary, comprehension and retention, and academic success. Its easy-to-use components work together to maximize growth.

Istation includes an integrated assessment tool called *Istation’s*, Indicators of Progress (ISIP Advanced Reading) which is a sophisticated web-delivered Computer Adaptive Testing (CAT). This system provides Continuous Progress Monitoring (CPM) by frequently assessing and reporting student ability in critical domains of reading throughout and across academic years (Mathes, 2016). The ISIP Advanced Reading system was designed for students in the upper elementary grades in fourth through eighth.

The ISIP Technical Manual is very comprehensive and informative for the layperson (parents) and educators. It is a resource for all educators, administrators, and parents. ISIP

Advanced Reading provides teachers and other school personnel with easy-to-interpret, web-based reports that detail student strengths and deficits and provide links to teaching resources.

According to Mathes (2016) the use of this data allows teachers to more easily make informed decisions regarding each student's response to targeted reading instruction and intervention strategies. ISIP Advanced Reading also provides growth information in four critical domains of reading, including Word Analysis, Text Fluency, Vocabulary, and Comprehension. The ISIP Advanced Reading is composed of 3,100 items (Spelling = 1,090, Vocabulary = 760, Connected Fluency Stories = 150, Comprehension passages = 220, and Comprehension questions = 880 [per passage]). Within the four domains, the complete item pool is distributed across the full continuum of middle school ability (i.e., Grades 2-14).

ISIP is designed to identify specific reading needs, provide automatic continuous progress monitoring of skills, and provide immediate feedback and differentiated instruction based on student learning needs (Mathes, 2016). All assessments are computer-based and can be administered to the entire class as part of computer lab time or individually as part of a workstation rotation. Assessment battery for any assessment period requires thirty minutes or less with results being immediately available to teachers. Thus, teachers can be alerted when a particular student is not making adequate progress so the instructional program can be modified before a pattern of failure becomes permanent.

The Indicators of Progress (ISIP) are administered monthly or upon initial login, if more than one month has passed, ISIP tailors the program's curriculum to address students' individual academic needs. The *Istation* vendor recommends that elementary school students use *Istation* curriculum for a minimum of 250 minutes, and middle school students for a minimum of 200 minutes throughout the school year. Implementation of the *Istation* reading program is funded through the Texas Students Using Curriculum Content to Ensure Sustained Success (SUCCESS) program, the Texas Education Agency, and the Regional Education Service Centers (ESC).

Istation provides the online interactive reading software program which includes engaging, interactive content in game-like format. This program supports students at all skill levels, and most importantly, it encourages progress and achievement as the students move from one activity to the next. *Istation*, is a pull-out program where selected students are provided with individualized instruction via computers or laptops at the computer labs or individual workstations. This program is designed to ease individual students into the cognitively demanding and highly contextualized academic language (Mathes, 2014).

Istation complements RTI by prescribing the appropriate differentiated instruction (through the *Istation* Priority Reports) and it goes further by maintaining an audit trail of all prescribed lessons and allowing teachers to document when those lessons were delivered (Mathes, 2014). *Istation* Indicators of Progress (ISIP) Assessments help RTI screening perform at its highest level through Universal Screening and Continuous Progress Monitoring. The purpose of ISIP is to measure reading ability and to identify deficits in critical reading areas to provide continuous differentiated instruction (Mathes, 2014).

Furthermore, ISIP is a research and standards-based formative assessment with computer-adaptive technology that selects successive questions dynamically, based on responses to previous questions, thus effectively tailoring the assessment to each student's level of ability. Mathes (2011) asserts that teaching that includes frequent monitoring of student progress has been shown to produce higher student outcomes in reading and mathematics than when monitoring is absent (Conte & Hintze, 2000; Mathes, Fuchs, Roberts, & Fuchs, 1998; Ysseldyke & Bolt, 2007).

ISIP also assesses all domains of reading for each grade level, including phonemic awareness, letter knowledge, alphabetic decoding, comprehension, vocabulary, spelling, and text fluency. *Istation* improves the students' performance by using the assessment and intervention curriculum together. This allows the teachers to identify student weaknesses and immediately provide data-informed instruction specific to each child's learning needs (Torgesen, 2004). Finally, ISIP identifies the needs of all student's form each reading domain, from struggling to advanced learners. Each student has an intervention instructional plan and set goals (*Istation*, 2004). The Advanced Assessment was used for this study. This Advanced Assessment is for grades four through eight. It consists of Word Analysis, Fluency, Vocabulary, and Comprehension (Mathes, 2014).

Multimedia Learning Outcomes

According to Mayer (2012), there are two major goals of learning- "remembering and understanding." He states, that remembering is the ability to reproduce or recognize the presented material and is assessed by retention tests. The most common retention tests are "recall" in which learners are asked to reproduce what was presented (for example, writing down all they can remember from a lesson they read) and "recognition" is that in which learners are asked to select what was presented (as in multiple-choice questions) or judge whether a given item was presented (as in a true or false question). Thus, the major issue in retention tests involves the quantity of learning, that is, how much information was remembered by the student.

Understanding is the ability to construct a coherent mental representation from the presented material; it is reflected in the ability to use the presented material in novel situations, and it is assessed with "transfer tests" (Mayer, 2012). A transfer test is where learners must solve problems that were not explicitly given in the presented material. That is, they have to apply what they learned to a new situation. An example is an essay question that asks students to generate solutions to a problem which requires to go beyond the presented material like inferencing in a reading comprehension test. The major issue in transfer tests involves the quality of learning, in other words, how well someone can use what they have learned (Mayer, p 19).

Two Approaches to Multimedia Design

Multimedia represents a potentially powerful learning technology-that is, a system for enhancing human learning. A practical goal of research on multimedia learning is to devise design principles for multimedia presentations. It is useful to distinguish between two approaches to multimedia design-a technology-centered approach and a learner-centered approach (Mayer, 2009).

In the technology-centered approach the designers try to adapt to the demands of the cutting-edge technologies. The driving force behind the implementation was the power of technology instead of an interest in promoting human cognition (Mayer, 2009). Thus, the focus was on giving people access to the latest technology rather than on helping people learn through the aid of technology. The learner-centered approach offers an alternative to the technology-centered approach. Learner-centered approaches begin with an understanding of how the human mind works. The focus is on using multimedia technology as an aid to human cognition. The premise underlying this approach is that multimedia designs that are consistent with the way the human mind works are more effective in fostering learning than those that are not (Mayer, 2009).

According to Mayer (2009) the term “multimedia” can be viewed in three ways; based on the devices used to deliver an instructional message (i.e., the delivery media), representational formats used to present the instructional message (i.e., the presentation modes), or the sense modalities the learner uses to receive the instructional message (i.e., sensory modalities). See Table 1 for the three views and their examples.

Table 1. *Three Views of Multimedia*

View	Definition	Example
Delivery media	Two or more delivery devices	Computer screen and amplified speakers; projectors and lecturer's voice
Presentation mode	Verbal and pictorial representations	On-screen text and animation; printed text and illustrations
Sensory modality	Auditory and visual senses	Narration and animation; lecture and slides

Multimedia represents a potential powerful learning technology that is a system for enhancing human learning. Multimedia has been around for the last 100 hundred years, first with the introduction of the motion pictures in 1922; then with the advent of the public radio receiver in 1945; later with the educational television in the 1950's; and finally, with the invention of the personal computer in 1970. They all promised to revolutionize education and the hopes and expectations were not met (Cuban, 1986 & 2001).

Literature Review Summary

In summary of the review of literature, public schools are faced with the dilemma of addressing the learning needs of struggling students. We need to see to it that struggling learners have their needs identified and addressed according to their developmental level in order to see appropriate levels of success. An appropriate and research-based instructional delivery system must in place in order for new learning to occur with the at-risk students.

In an article, entitled, "*Will media influence learning: Reframing the debate*," Kozma (1994) developed a statement from the research of Shuell (1988). That statement illustrates "how learning is an active, constructive, cognitive and social process by which the learner strategically manages available cognitive, physical, and social resources to create new knowledge by interacting with information in the environment and integrating it with information already stored in memory." Also, according to MacKinnon (2002) when technology is used correctly and with fidelity, "teachers can provide a learning environment that helps expand the conceptual and experiential background of the readers" (p. 58).

According to the Nation's Report Card, in 2015, Hispanic students had an average score that was 25 points lower than that for White students (U.S. Department of Education, 2015). Fundamentally, as Moats (2009) has maintained that teachers will need to have a strong, fundamental knowledge of the language structure, reading development, and differentiation in order to meet the needs of students who struggle in reading.

Lastly, according to Slavin and Cheung (2004) systematic phonics instruction can help ELLs learn decoding skills and when they learn the meaning of words they can connect them to the texts.

CHAPTER III

RESEARCH DESIGN AND METHODOLOGY

The purpose of this non-experimental quantitative study was to investigate the difference in students' reading achievement before and after receiving a targeted reading intervention. The *Istation* Advanced Reading Program was the choice for reading intervention program. Data collection was accomplished through the collection of reading scores for the fourth-grade at-risk and non-at-risk student population from one South Texas school district for one academic school year (2016-2017). This chapter details the methodology by which data was collected and analyzed to test the research questions.

For this study, the researcher used the quantitative, causal-comparative research design. Both descriptive and inferential statistics were used to understand how the independent variable impacted the students' performance on the state-mandated reading assessments. According to Johnson (2000) the only difference between causal-comparative and experimental research is that the groups being compared in causal-comparative research have already been formed, and any treatment (if there was a treatment) has already been applied.

The researcher attempted to identify a causative relationship between the independent variable and a dependent variable. However, the researcher did not have complete control over the independent variable. The independent variable was the treatment of providing supplemental instruction in a reading remediation class with the *Istation* Advanced Reading software package and the dependent variable was STAAR Reading Assessment scores obtained in May for the academic school year.

In essence, this study utilized the "ex post facto" research design. Ex post facto research is ideal for conducting research when it is not possible to manipulate the characteristics of human participants. Ex post facto research is a substitute for true-experimental research and can be used to test hypotheses about cause-and-effect or correlational relationships, where it is not practical or ethical to apply a true experimental, or even a quasi-experimental design.

Purpose of the Study

The primary purpose of the study was to examine the impact of the *Istation* Reading Program on reading achievement of fourth-grade at-risk students in a South Texas school district. This study examined the effect of an instructional treatment (computer-assisted instruction versus traditional classroom instruction) on individual learning achievement from a stratified random sample of fourth grade at-risk students.

The secondary purpose of the study was to document the progress of all reading students in the three elementary Title I schools. The at-risk and the non-at-risk students all participated in the same reading program with different goals, however, the effectiveness of the *Istation* reading program was applied to both groups. This study will provide insight and an enriched understanding of student response to the computer-assisted instruction used by the students while improving their reading skills in the computer lab setting.

Population

For this study, the researcher did not use student participants. However, the archival records are from the three cohorts of students who participated in the *Istation* Advanced Reading

Program for the current academic school year 2016-2017. The full demographics and educational characteristics of the three groups of participants are found in Table 1.

Primarily, the student demographics were composed of both male and female students of Hispanic ethnicity at three Title I elementary schools in a small school district in South Texas. Total population for this small school district is approximately 2,500 students in grades Pre-K through 12th grade. In general, no random assignment was used to ensure that the student groups were essentially equivalent before the experiment. However, a cut-off score provided by the school district was used for selection of the participants. All students who failed their third grade Reading STAAR Test are labeled as at-risk students for this study.

The two groups did not differ significantly in age or educational levels. Non-identified student records came from fourth graders in three reading cohorts spread across three Title I elementary schools that participated in the casual-comparative study. Students labeled as at-risk participated in the regular classroom along with their not-at-risk peers during most of the day except for the allocated thirty-minute sessions in which they participated with fidelity in the *Istation* Advanced Reading Program. Table One depicts the characteristics of the students in the 2016-2017 reading cohorts.

Table 2. *Demographic Characteristics of Students*

Groups	At-Risk Group		Non-At-Risk	
	n	%	n	%
Gender				
Female	40	16.4	84	34.4
Male	37	15.2	83	34.0
Total	77	31.6	167	68.4

The researcher selected three groups or cohorts from the school district's three Title I elementary schools. The three campuses provided archival records for the non-identified students from the transitional English reading class who failed their third grade STAAR Reading Test and those students who scored at or below the 20^{th} percentile, and those who scored above the 20^{th} percentile.

Table 3. *ANOVA (BOY and EOY)*

		Sum of Squares	Df	Mean Square	F	Sig.
Score/Sept	Between Groups	88375.681	2	44187.841	1.395	.250
	Within Groups	7600995.750	240	31670.816		
	Total	7689371.437	242			
Score/May	Between Groups	48028.751	238	24014.376	.647	.525
	Within Groups	8837417.251	238	37132.005		
	Total	8885446.002	240			

For the schools, there is no group difference in *Istation* scores in September across the three schools. (F (2,240=1.40, p >.05). Additionally, there is no group difference in *Istation* scores in May across the three schools (F (2,238=0.65, p > .05).

This study compared the progress of a sample population of seventy-seven (n=77) at-risk students along with the one-hundred and sixty-seven non-at-risk students (n = 167) as they completed their tiered instruction within the 24-week period of supplemental reading instruction by using the *Istation* ISIP scores and the STAAR Reading scaled test scores. These students were labeled as low, intermediate or moderate, and advanced when placed in their individualized *Istation* reading groups. Furthermore, comparison was made with those students' records who failed the STAAR Reading Assessment and those students' records who scored below the 20th percentile and above the 20th percentile on their 2016 state reading test (within their own cohorts).

The researcher was aware that teachers used the "pull-out" and "push-in" methods of reading instruction for their classrooms. The "pull-out" method refers to small group instruction when they are removed from the general classroom to the computer laboratory for the *Istation* reading services with another instructor. This other instructor is usually a paraprofessional who has experience with technology in educational settings. The computer laboratory was a large improvised classroom with an inventory of 20 desks and 20 brand new Dell laptops for the participating students. The laptops were stored in what is called a cow. The acronym "COW," stands for computers on wheels. The "push-in" method refers to another teacher or para-professional coming into the general education classroom to assist the classroom teacher and work with specific students on a one-to-one basis with the instructional concepts that are too difficult for them.

The archival records of the continuously monitored sample population consisted of 78 (Tier 2) at-risk students in the transitional reading classes with varying reading percentile cut-off scores. These students received the *Istation* services and curriculum. They were compared to other (Tier 2) at-risk students with higher reading percentile cut-off scores. A total of three Title I Elementary schools described as School (A), School (B), and School (C) were used to collect data for this study. Additionally, the campus teachers, paraprofessionals, and principals were interviewed at the end of the study to record their experiences with the non-identified students in the *Istation* Advanced Reading Program in order to enrich this study's outcomes.

According to the Texas Education Agency's criteria, public schools qualify for a Title I designation and receive federal funding if over 40 percent of the students receive free and reduced lunch at school (TEA, 2016). The criteria used for this study, indicated that students are from low-income households (UCF Report, 2014). The designation of Title I status was determined by information obtained from the Texas Education Agency's (TEA) demographic database. For this study, ninety-seven percent of the students enrolled in the *Istation* Reading Program who attended Title I schools were classified as at-risk students given their socio-economic status (TEA, 2016).

Instrumentation

The instruments used for monitoring the students' reading progress were the *Istation* Indicators of Progress (ISIP) and the 2016 fourth grade STAAR Reading Test. ISIP was developed to be used during the self-learning modules and to determine competency in the students' reading skills in this Texas SUCCESS reading intervention program. ISIP is a computer-adaptive assessment tailored to the performance of individual children.

The ISIP Total Reading Score was used to classify high and low responders with their rate of improvement (ROI) (Mathes, 2014). The *Istation* Advanced Reading Program (rich in multimedia) was the treatment used as the independent variable. And the administration of the fourth grade STAAR Reading Test was the dependent variable for this study used as the posttest for this study and its research design.

The Posttest follows the administration of the treatment for both the experimental and control groups (Johnson & Christensen, 2012). According to Johnson and Christensen (2012) with the posttest-control-group design, many threats to internal validity are eliminated because of the addition of the control group. However, for this study only the growth within the groups was used for validation. Also, a multivariate analysis of variance (MANOVA) was performed to analyze the results and to control Type I errors.

Reliability and Validity

In order to test the validity and reliability of the ISIP Reading Assessment in the program, research was conducted under four reading domains: word analysis, comprehension, vocabulary, and fluency. Reliability testing began with seven thirty-minute ISIP Reading Assessments given to students in the three school groups. Further validity measures were taken by testing the correlations between the Rates of Improvement (ROI), and the ISIP Reading Assessments. Correlation scores were recorded from September 2016 to May 2017. See Table 4 for the September baseline score or beginning of year scores (BOY). The rates of improvement are labeled as ROI (3) for high advancement, ROI (2) for moderate advancement, and ROI (1) for low advancement in the students' reading baseline scores in their reading assessments.

Table 4. *Scores for September (BOY)*

Scheffe[a,b]

ROI New	N	1	2
3.00	39	1762.823720	1762.8237
2.00	94	1773.166860	1773.1668
1.00	109	1840.52953	1840.5295
Sig		.944	.088

In September, there were 109 students who benchmarked at the low level; 94 scored at the intermediate level; and 39 scored at the high level. The intent of this study is to demonstrate if there existed significant growth throughout the 12 months of implementing the *Istation* Advanced Reading software program with the at-risk and non-at-risk readers at the three participating elementary schools.

Final validity measures will be determined by comparing the reading scores of the ISIP Reading Assessment and the 2017 State of Texas Academic Assessment in Reading (STAAR). The reliability and validity evidence indicates that the ISIP Reading Assessment is a reliable and valid reading test used with the *Istation* Advanced Reading Program (Mathes, 2014).

Data Collection

Prior to starting the research process of this study, the researcher obtained permission from the Institutional Review Board (IRB) at the University of Texas-Rio Grande Valley. Upon approval, the researcher met with the school district's Superintendent of Schools to discuss the purpose of the study and to clarify any questions about the research process and timeline. Then the researcher met with his dissertation committee members to gain permission to proceed with the collection and analysis of data.

Before the researcher's retrieval of academic reports, the district's testing coordinator omitted all student names from the data and created a unique local identification number for each student in order to protect the confidentiality of student data. The data was presented to the researcher in a singular file of the entire cohort's Texas STAAR reading scaled scores and the *Istation* ISIP monthly scores and reports.

The ISIP reports consisted of the three components of reading ability assessed by the *Istation* Advanced Reading Curriculum. Those reading components were fluency, vocabulary, and comprehension with each student receiving a composite overall score. Scores were reported at the beginning of the school year (BOY), at the middle of the school year (MOY), and at the end of the school year (EOY).

Intervention Methodology

The data for this study was collected from archival records provided by the district's office of Curriculum and Instruction. Archival records came from the 78 fourth grade students labelled as at-risk students and the 169 labelled as non-at-risk students enrolled in three elementary schools in a South Texas rural school district.

Documentation of their reading scores in the *Istation* Advanced Reading curriculum was continuously monitored throughout the eight-month period with the *Istation* monthly summary reports and the monthly "Priority Reports." A complete history of Priority Report notifications, including those from the current year and all prior years are maintained by the school district for each student. The monthly Priority Report alerts teachers of students needing additional support and provides lessons based on demonstrated weaknesses. Furthermore, links are provided to teacher-directed lesson plans of instruction with downloadable lessons and appropriate materials for each group (Mathes, 2006).

For this study, students were grouped according to their identified risk-level and academic need. Some students received remedial instruction via the supplemental *Istation* Reading Program while the others received the *Istation* Reading Program as part of their enrichment reading class. Performance tracking was discernable for all students due to the "Priority Reports."

Primarily, the data used for statistical analysis was collected from two sources: (1) results of the pre-and-post-test scores, and (2) the results of the ISIP Advanced Reading Assessments. All quantitative data was obtained from the school district in which the study took place and from the Texas Education Agency website (TEA). Specifically, *Istation* (ISIP) scaled scores, monthly growth reports, and the raw STAAR Reading Assessment scores were the primary data.

These data collected for this study was analyzed to determine if the participant demonstrated growth, or not, in their achievement of reading proficiencies. *Istation* monthly summary reports and scores will be used to validate the effectiveness of this reading intervention strategy. Pre-and-Post intervention measures and intervention sessions were conducted at the three participating elementary schools' Dell computer labs. These scores served as the base-line scores, too.

During the reading intervention periods, participants worked at a Dell computer station which consisted of a student laptop computer with a set of earphones along with some paper and pencil supplies for the worksheet assignments needed for the more intense reading interventions. Throughout the school year, all fourth grade students completed the *Istation* Advanced Reading Program activities which are individually designed to improve their reading skills and fluency. All students began their reading progressive lessons in Tier 1 which address grade level reading skills.

Through the *Istation* Advanced Reading Program, students were diagnosed and placed in their individual independent reading levels based on the three-tiered model. Students who placed at or below the 40^{th} percentile were placed in the Tier 2 reading level. Tier 2 students will spend about thirty minutes per day working on the *Istation* programs during their scheduled sessions per week. *Istation* served as a supplemental reading resource where students practiced on their as part of their personalized instructional path as of the reading support provided by the Texas SUCCESS. These data was analyzed using descriptive and statistical techniques using the SPSS software packet (Version 25).

Data Analysis

The quantitative data was collected and coded by the researcher during the summer of 2017. All data was entered into the DELL Computer used for the data analysis. Descriptive and inferential statistics formed the basis of the data analysis results as the researcher intended to examine frequency distributions, measures of central tendencies, and measures of variance in group means by using the *t*-test statistical method (Fink, 2013). Descriptive statistics were used to summarize and organize the data. Data analyses were conducted using the Microsoft Excel and the Statistical Package for Social Sciences (SPSS) Version 25.

Inferential statistics were used for the statistical analysis such as, ANOVA, Levene.s Test for Equality of Variances, and Scheffe tests. Post Hoc tests, and *t*-tests were performed on the data as well to measure the difference in means. Also, a series of paired samples t-tests was conducted to analyze the data for the five Research Questions used to explore the effectiveness of the *Istation* Advanced Reading Program...

According to Green and Salkind (2003) a paired samples t-test evaluates whether the mean of the difference between two variables is significantly different from zero. Pearson product moment correlation coefficients were used to establish "test" and "retest" reliability evidence between the ISIP Reading administrations. Additionally, scores were analyzed with the linear regression model methods to identify positive and negative outcomes of the study and to draw conclusions on the effectiveness of the implementation of the *Istation* curriculum. The proportion of the total number of test questions answered correctly to the total number of questions were used to measure achievement in reading in each STAAR category.

Levene's F was used to test the homogeneity of variances assumption (Field, 2013). For specific results, beginning-of-year (BOY) pretests, middle-of-year tests (MOY), and end-of-year (EOY) post-tests results were used in this reading study. As previously noted in Table 3, the September's *Istation* Reading Index scores served as the benchmark scores for the Rate of Improvement (ROI) for all students enrolled in fourth grade.

In order to follow protocol and standards, the data collection for this study will take place during the defined period during the academic school year 2016- 2017. The student data will come from the collection of archival data of student records during the time of the study. Archival records will come from the 24 weeks of student participation in the *Istation* Advanced Reading Program.

There was no actual contact with the participants (teachers, para-professionals, and principals) during the time of the study. However, as part of my exit criteria segment, I will interview the administrators and participating teachers who delivered the *Istation* Advanced Reading Program curriculum to the students during the course of the school year. During this time-period the students' ISIP scores and progress reports were analyzed by the researcher. This data will include the Beginning-of-Year (BOY), Middle-of- Year (MOY) *Istation* Reports and the End-of-Year (EOY) *Istation* Reports. Baseline scores will also be included for comparison purposes

Chapter Summary

In order to summarize the methodology, the researcher will focus on the fact that reading is an integral part of today's educational system and "children who experience difficulties reading and understanding information in written text form tend to suffer from problems in schools and their communities" (NCES, 2010, p. 8). Fuchs, Fuchs, and Compton (2010) recommend that school services should be geared towards assessing risk and providing targeted instruction for high-risk students.

Statistical techniques must be appropriate for the research design and data limitations. Much of the research in education is deemed non-experimental, meaning there is an absence of control groups, and of randomized assignment of participants and treatment. Statistical techniques must address this concern in every study. Statistical procedures were selected from the nature of the data and comparison groups who used the *Istation* Advanced Reading Program software and its' curriculum along with its teacher resources.

The *Istation* Advanced Reading Program's curriculum consisted of the following constructs: wording meaning, fluency, vocabulary, reading comprehension, and phonemic awareness. The researcher targeted this intervention for fourth-grade at-risk students who are struggling with phonological language and reading skills. These students are usually labeled as English language learners (ELLs) or students with specific reading deficits. It is hoped that the efficacy of the reading interventions will allow for the students in the intervention group to show gains in their rate of learning and the end-of-year outcomes at the local and national levels.

At the national level, the National Assessment of Educational Progress (NAEP) measures the progress of our nation's fourth and eighth graders in mathematics and reading. NAEP Scores are reported at five selected percentiles to show the progress made by lower- (10^{th} to 25^{th} percentiles), middle- (50^{th} percentile), and high- (75^{th} percentile and 90^{th} percentile) performing students. Historically, between 2013 and 2015, the percentage of fourth-grade students scoring at or above *Proficient* in reading did not change significantly (NAEP, 2016). In comparison to 2015, reading scores were lower for fourth-graders performing at the 10^{th} and 25^{th} percentiles

The Nation's Report identified that only 35% of grade 4 students scored at or above *Proficient,* whereas in 2015, 32% of grade 4 students scored at or above *Proficient*. Texas had an average reading score of 218 which was not significantly different from the National public average. According to the Nation's Report Card, this is only a one percent increase, but moving in the right direction, however, the 2017 National public average for reading was 221 with the Texas reading score of 215 being significantly lower than the National public average.

CHAPTER IV

RESULTS AND FINDINGS

Introduction

The purpose of this quantitative study was to determine whether there was a significant impact on students' reading STAAR scores due to intervention instruction delivered via the program *Istation* Advanced Reading Program in one South Texas school district. This study was delimited to fourth grade students on three different Title 1 elementary campuses.

Research Questions

This causal-comparative study examined the effectiveness of the *Istation* Advanced Reading Program with different school district campuses and their student populations. The researcher had five quantitative questions. The research questions for this study include the following:

RQ1. Is there a significant difference between English Language (EL) students' and Non-EL students' Texas STAAR Reading Test Scaled Scores before and after the implementation of the *Istation* Advanced Reading Program?

RQ2. Is there a significant difference between Migrant students' and Non-Migrant students' STAAR Reading Scaled Scores after the implementation of the *Istation* Advanced Reading Program?

RQ3. Is there a significant difference between STAAR Reading Scaled Scores between male and female students who participated in the *Istation* Advanced Reading Program?

RQ4. Is there a significant difference in STAAR Reading Scaled Scores between at-risk and non-at-risk students who participated in the Istation Advanced Reading Program at the end of the nine-month reading program?

RQ5. Is the Istation Usage Time significant for the male and female students using the *Istation* Advanced Reading Program?

Data

Participants' data for this study included all the third and fourth-grade students from the three different campuses. The nine fourth-grade classes received reading interventions for three days a week for a maximum of 30 minutes per day for 24 weeks during the academic school year. The non-at-risk students also received the *Istation* curriculum as part of their regular reading program and their *Istation* Index Scores were tabulated for the purposes of this study.

The quantitative data was obtained from the school district's curriculum and instruction department. The data was coded and entered into the computer and analyzed using the Statistical Package for the Social Sciences (SPSS) Version (25). The demographic data was obtained for the following variables: gender, socio-economic status, at-risk and non-at-risk, migrant, and Limited English proficiency. The dataset was obtained for the 2015-2016 and 2016-2017 school years respectively.

For this study, the data was analyzed for these subgroups: At-Risk and Non-At-Risk, Limited English Proficient (LEP), Migrant, and Gender. Furthermore, descriptive statistics, exploratory data analysis (EDA), ANOVA, and correlational analyses were used to analyze the data. The level of significance was set at alpha = 0.05.

Analysis of Results

Research Question 1

RQ1: Is there a significant difference between English Language (EL) students' and non-EL students' Texas STAAR Reading Test scaled scores before and after implementation of *Istation* Advanced Reading Program?

LEP vs. Non-LEP

The term "limited english proficiency" was first used in 1975 following the U.S. Supreme Court decision in *Lau v. Nichols*. Students who are not proficient in their English language skills as determined by the Language Proficiency Assessment Committee (LPAC) have been labeled as being "limited in their English language skills. These students are also called English Language Learners (ELLs) or English Learners (ELs) for the purposes of identification and category.

Table 5. *Passing Rate between LEP vs. Non-LEP in 2016 and 2017*

	LEP	N	Mean	Std. Deviation	Std. Error Mean
Pass Third	Y	55	.5455	.5025	.06776
	N	192	.7240	.4482	.0323
Pass Fourth	Y	55	.6182	.4903	.0661
	N	192	.7135	.4532	.0327

From Table 5, students that were categorized as LEP (n = 55) had a Mean passing rate = .55 (SD = .50) on their third grade STAAR Reading Test in 2016 whereas students that were non-LEP (n = 192) had a mean passing rate = .72 (SD = .45) on their third grade STAAR Reading Test in 2016.

From Table 5, students that were categorized as LEP (n = 55) had a Mean passing rate = .62 (SD = .49) on their fourth grade STAAR Reading Test in 2017 whereas students that were non-LEP (n = 192) had a mean passing rate = .71 (SD = .45) on their fourth grade STAAR Reading Test in 2017.

In Table 6, the researcher analyzed the Scaled STAAR Reading Scores for the 2016 and 2017 assessments. For this study, the LEP students, are considered, to be at-risk due to their English language literacy skills. Results are demonstrated in the following table.

Table 6. *Group Statistics (LEP)*

	LEP	N	Mean	Std. Deviation	Std. Error Mean
2016 Scale	Y	55	1371.818	118.9860	16.0441
	N	192	1399.995	203.9586	14.7194
2017 Scale	Y	55	1464.091	142.1054	19.1615
	N	192	1477.943	217.0343	15.6631

From Table 6, in 2016, students were categorized as LEP (n = 55) had a Mean = 1371.82 (SD =118.99) on their STAAR Reading Test, whereas, students that were not considered LEP (n =192) had a Mean = 1399.99 (SD = 203.96).

In 2017, students were categorized as LEP (n = 55) had a Mean = 1464.10 (SD =142.11) on their STAAR Reading Test, whereas, students that were not considered LEP (n =192) had a Mean = 1477.94 (SD = 217.03).

Table 7. *Independent Samples t-Test*

		Levene's Test for Equality of Variances		*T*-test for Equality of Means				
		F	Sig	t	df	Sig. (2 tailed)	Mean Diff.	Std. Error Dif.
Pass Third	Equal variances assumed	12.406	.001	-2.533	245	.012	-.31729	-.03971
	Equal variances not assumed			-2.377	80.238	.020	-.32792	-.02909
Pass Fourth	Equal variances assumed	5.318	.022	-1.350	245	.178	-.23444	.04372
	Equal variances not assumed			-1.293	82.284	.200	-.24209	.05137

The *t*- test compares two averages (means) and tells you if they are different from each other. The t test also tells you how significant the differences are; in other words it lets you know if those differences could have happened by chance.

Students' 2016 STAAR had (Mean Difference = -.33, SE = -.03, t = -2.38, df =80.24, p = .020). Statistical significance was found with *t* (*df* = 80.24) = -2.38, *p* = .02. However, there was no statistical significance in STAAR Reading Test scores between LEP and Non-LEP students in 2017 (Mean Difference = -.24, SE = .05, *t* = -1.29, *df* = 82, *p* = 200)

Table 8 provides us with the group statistics for the students that were categorized as LEP and those categorized as non-LEP on *the Istation* monthly Index Scores.

Table 8. *LEP vs Non-LEP Istation Scores from Sept. 2016 to May 2017*

	LEP	N	Mean	Std. Deviation	Std. Error Mean
Score/ Sept.	Y	55	1768.8808	162.9987	21.9787
	N	188	1809.9177	181.8357	13.2617
Score/Oct.	Y	55	1799.0277	171.8010	23.1656
	N	188	1844.4913	197.8444	14.4292
Score/ Nov.	Y	55	1804.8281	176.9692	23.8625
	N	188	1856.8177	170.6694	12.4473
Score/Dec.	Y	55	1818.9788	190.3125	25.8982
	N	188	1877.3693	183.4634	13.3804
Score/ Jan.	Y	55	1840.0635	177.4045	23.9212
	N	191	1865.8027	192.3081	13.9149
Score/Feb.	Y	55	1839.3208	182.1589	24.5623
	N	191	1888.2905	188.0737	13.6085
Score/ Mar	Y	55	1852.6113	171.6027	23.1389
	N	191	1889.8939	203.6521	14.7354
Score/Apr	Y	55	1856.0049	190.4021	25.6735
	N	187	1910.3501	193.7692	14.1698
Score/ May	Y	54	1857.8833	177.1051	24.1009
	N	187	1907.8120	195.6321	14.3060

In Table 9, the researcher found that Rate of Improvement (ROI) for LEP and Non-LEP students was significant as evidenced by the mean and standard deviation values. The standard deviation is used as a measure of variability. The larger the standard deviation, the more spread out the values are, and the more different from one another. The LEP students did better on their ROI improvement rates.

Table 9. *Rate of Improvement*

	LEP	N	Mean	Std. Deviation	Std. Error Mean
ROI(new)	Y	55	1.7273	.7316	.0986
	N	191	1.7173	.7353	.0532
ImprovRate	Y	54	5.2945	4.5481	.6189
	N	183	5.2028	5.2970	.3915

Table 10. *Independent Samples Test*

		Levene's Test for Equality of Variances		*T*-test for Equality of Means						
		F	Sig	t	df	Sig. (2 tail)	Mean Dif Low	Up	Std. Error Dif.	95% Conf Interval
2016 Scale	Equal variances assumed	2.208	.139	-1.170	245	.243	-65.2227	55.7550	-175.0429	44.5975
	Equal variances not assumed			-2.677	20.218	.014	-65.2227	24.3639	-116.0098	-14.4356
Pass Third	Equal variances assumed	1.480	.225	-2.053	245	.041.	-.28121	.13696	-.55097	-.01145
	Equal variances not assumed			-1.854	11.915	.089	-.28121	.15165	-.61188	.04957
2017 Scale	Equal variances assumed	.427	.54	-1.066	245	.288	-63.8784	59.9378	-181.9375	54.1807
	Equal variances not assumed			-1.798	14.949	.092	-63.8784	35.5253	-139.6214	11.8646
Pass Fourth	Equal variances assumed	1.696	.194	-2.132	245	.034.	-.28972	.13590	-.55739	-.02204
	Equal variances not assumed			-1.911	11.899	.080	-.28972	.15160	-.62033	.04090

The researcher discovered good results because after a year of *Istation*, there is no significant difference in STAAR Reading Test between LEP and Non-LEP students. Though we cannot always predict outcomes, the use of *Istation* may still play an important role in closing the gaps of STAAR Reading Scores between LEP and Non-LEP's performance.

Research Question 2

RQ2. Is there is a significant difference between Migrant students' and Non-Migrant students' STAAR Reading Scaled Scores after the implementation of the *Istation* Advanced Reading Program?

Migrant vs. Non-Migrant Students

For this study, migrant students are considered to be at-risk students and their group statistics were included in the study. In Table 11, we can determine that only 12 students were categorized as Migrant Students with their statistical descriptors as follows.

Table 11 breaks down the STAAR Scaled Reading scores into migrant strands and non-migrant.

Table 11. *Migrant vs. Non-Migrant STAAR Reading Scores in 2016 and 2017*

	MIGRANT	N	Mean	Std. Deviation	Std. Error Mean
2016 Scale	Y	12	1331.667	72.375	20.893
	N	235	1396.889	192.128	12.533
2017 Scale	Y	12	1414.083	113.942	32.892
	N	235	1477.962	205.751	13.421

In 2016, there were 12 migrant students and 235 non-migrant students. There were 12 migrant students with a mean of 1331.67 and a standard deviation of 72.38. There were 235 non-migrant students with a mean of 1396.89 and a standard deviation of 192.13. In 2017, the numbers did not vary, however, the mean for the migrant students was 1414.08 with a standard deviation of 113.94. The mean for the non-migrant students was 1477.96 with a standard deviation of 205.75.

Table 12. *Group Statistics for Migrant Students*

	MIGRANT	N	Mean	Std. Deviation	Std. Error Mean
Pass Third	Y	12	.4167	.5149	.1486
	N	235	.6979	.4601	.0300
Pass Fourth	Y	12	.4167	.5149	.1486
	N	235	.7064	.4563	.0297

In Table 12, for the school year 2016, the passing rate for the third-grade migrant students had a mean of 0.42 and a standard deviation of 0.51, whereas, the non-migrant students had a mean of 0.70 and a standard deviation of 0.03. The passing rate for the fourth-grade migrant students in 2017 had a mean of 0.42 and a standard deviation of 0.51. The passing for the fourth-grade non-migrant students had a mean of 0.70 and a standard deviation of 0.45.

Table 13. *Independent Samples Test*

		Levene's Test for Equality of Variances		*T*-test for Equality of Means						
		F	Sig	t	df	Sig. (2 tail)	Mean Dif	SE	Conf. Inter	
Pass Third	Equal variances assumed	1.480	.225	-2.053	245	.041	-.281	.136	.555	-.011
	Equal variances not assumed			-1.854	11.915	.089	-281	.151	-.611	.049
Pass Fourth	Equal variances assumed	1.696	.194	-2.132	245	.034	-.289	.135	-.557	-.022
	Equal variances not assumed			-1.911	11.899	.080	-.289	.151	-.620	.040

In Table 13, for the school year 2017 there was a significant difference in the for the fourth-grade passing rate between migrant students and non-migrant students (Mean Diff = -.28972, SE. = -.55739, t = -2.132, df = 245, p = .034). For the school 2016, there was a significant difference for the third grade passing rate between migrant and non-migrant students (Mean Diff = -.28121, SE. = .555097, t = -2.053, df = 245, p = .041).

Table 14. *Group Statistics (Migrant)*

	MIGRANT	N	Mean	Std. Deviation	Std. Error Mean
Score/ Sept.	Y	12	1658.2438	211.6160	61.0883
	N	231	1808.0262	173.7170	11.4297
Score/Oct.	Y	12	1713.6380	222.7892	64.3137
	N	231	1840.4642	189.6444	12.4776
Score/ Nov.	Y	12	1674.8013	220.0999	63.5373
	N	231	1853.8946	166.2158	10.9361
Score/Dec.	Y	12	1735.4631	173.7782	50.1654
	N	230	1871.0640	184.7332	12.1809
Score/ Jan.	Y	12	1764.3448	166.4080	48.0378
	N	234	1864.9559	189.1283	12.36370
Score/Feb.	Y	12	1708.0585	235.4945	67.9814
	N	234	1886.0232	181.1184	11.8400
Score/ Mar	Y	12	1735.3715	295.3254	85.2531
	N	234	1889.0551	188.7459	12.3387
Score/Apr	Y	11	1785.5422	164.0400	49.4599
	N	231	1903.3540	193.9521	12.7611
Score/ May	Y	12	1762.6068	235.8671	68.0889
	N	229	1903.6475	187.8625	12.4143

Table 15. *Rates of Improvement*

	MIGRANT	N	Mean	Std. Deviation	Std. Error Mean
ROI(new)	Y	12	1.9167	.79296	.22891
	N	234	1.7094	.73022	.04774
ImprovRate	Y	12	6.2722	3.69264	1.06597
	N	225	5.1678	5.19251	.34617

In Tables 14 and 15, we can see the results for the Migrant and Non-Migrant students as they progressed through *Istation* Reading Curriculum with their Mean Scores and Standard Deviations along with the Standard Error Means. No significant gains are demonstrated in the data due to the students' shortened academic school year.

Research Question 3

RQ3. Is there a significant difference between STAAR Reading Scaled Scores between male and female students who participated in the *Istation* Advanced Reading Program

An independent-samples t-test was conducted to evaluate whether the mean reading scaled score on the 2016 STAAR Reading Test differed between male and female students who participated in the intervention program *Istation* Advanced Reading Program. The 2017 STAAR Reading scaled score was the test variable and the grouping variable was gender. The test was not significant. Male students did not significantly score higher or lower than female students.

Table 16 provides a snapshot of the descriptive statistics for the tested groups in 2016 and 2017 with the means and standard deviations for the Raw and Scaled derived from the STAAR Reading Assessments for this archival study. When we analyze the mean differences and the differences in standard deviations for the 2016 and 2017 Scaled scores, we can see that there was a significant increase. Hence, the differences indicate a significant improvement in student state-mandated test scores for 2017 after the implement of the reading intervention program

Table 16. *Descriptive Statistics*

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Skewness
2016 Raw	247	35.0	5.0	40.0	24.842	8.3717	-.349
2016 Scale	247	1674.0	234.0	1908.0	1393.721	188.5319	-2.799
2017 Raw	247	31.0	5.0	36.0	22.980	7.5930	-.435
2017 Scale	247	1700.0	271.0	1971.0	1474.858	202.5800	-2.768
Valid N	247						

Table 17 breaks down the student sample into gender strands. There were 124 females tested and 123 males that received the with the *Istation* curriculum and ISIP assessments before their fourth-grade state mandated assessments in reading.

This table provides us with the group statistics for the 2017 STAAR Reading Test scores. It identifies the students' scores based on gender. Girls tend to fair better than boys on their state assessments based on the mean differences

Table 17. *Group Statistics (Gender)*

	Gender	N	Mean	Std. Deviation	Std. Error Mean
2106 Scale	F	124	1406.79	172.16	15.46
	M	123	1380.54	203.56	18.35
2017 Scale	F	124	1497.64	181.83	16.32
	M	123	1451.88	219.89	19.82
Score/Sept	F	122	1818.39	151.69	13.73
	M	121	1782.71	200.57	18.23
Score/May	F	120	1926.79	153.12	13.97
	M	121	1866.69	221.31	20.11

In Table 17, the researcher describes the group statistics for scaled STAAR reading scores for gender. In 2016, students categorized as females had a mean = 1406.79, (SD = 172.17). For male category they had a mean = 1380.55 and (SD) 203.56. In 2017, females (n=124) had a mean = 1497.65, (SD = 181.84). Males (n = 123) had a mean of 1451.89, (SD = 219.90).

Group statistics for September categorized as females (n=122) had a mean of 1818.40 with (SD = 151.69). Males (n=121) had a mean of 1782.72 with (SD = 200.58). Group statistics for September females (n = 120) had a mean of 1926.80 and (SD = 153.13) and for males (n= 121) had a mean of 1866.70 with (SD = 221.31).

In Table 18, gender group statistics for students who passed third, we have females (n=124) with a mean = .67 and (SD= .47) and males (n-123) with a mean = .70 and (SD= .46). For students who passed fourth, we have females (n=124) with a mean = .69 and (SD= .42) and males (n-123) with a mean = .69 and (SD= .46).

Table 18. *Passing Rare for Gender (Group Statistics)*

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Pass Third	F	124	.6694	.4723	.0424
	M	123	.6992	.4604	.0415
Pass Fourth	F	124	.6935	.4628	.0415
	M	123	.6911	.4639	.0418

In Table 19, an Independent Samples Test was run to test for equality of variances and means for the gender groups who passed their third-grade STAAR Reading Tests and their fourth-grade STAAR Reading Tests. For the gender group statistics there are no significant differences in passing rates between boys and girls for 2016 and 2017. Descriptive statistics are ($t = -503$, $df = 245$, $p > .05$ in 2016 and $t = .042$, $df = 245$, $p > .05$ in 2017).

Table 19. *Independent Samples Test*

		Levene's Test for Equality of Variances		*T*-test for Equality of Means						
		F	Sig	t	df	Sig. (2 tail)	Mean Dif Up.	Low	Std. Error Dif.	95% Conf Interval
Pass Third	Equal variances assumed	1.008	.316	-.503	245	.616	-.022983	.05936	-.14676	.08710
	Equal variances not assumed		-.503	244.927	.616	-.022983	.05936	-.14675	.08708	
Pass Fourth	Equal variances assumed	.007	.933	.042	245	.966.	.00249	.05897	-.11367	.11865
	Equal variances not assume			.042	244.973	.966	.00249	.05897	-.11367	.11865

In Table 20, an Independent Samples Test was run to test for equality of variances and means for the gender groups who passed their third-grade STAAR Reading Tests and their fourth-grade STAAR Reading Tests. For the gender group statistics there are no significant differences in passing rates between boys and girls for 2016 and 2017. Descriptive statistics are (t = -503, df = 245, $p > .05$ in 2016 and t = .042, df = 245, $p > .05$ in 2017).

Table 20. *Group Statistics*

	Gender	N	Mean	Std. Deviation	Std. Error Mean
2016 Scale	M	123	1380.545	203.561	18.354
	F	124	1406.790	172.169	15.461
2017 Scale	M	123	1451.886	219.896	19.827
	F	124	1497.645	181.837	16.329
Score/Sept	M	121	1782.715	200.576	18.234
	F	122	1818.396	151.692	13.733
Score/May	M	121	1866.699	221.313	20.119
	F	120	1926.799	153.125	13.978

Table 21 addresses the differences in mean groups between the gender groups and their STAAR Reading Scaled Scores. In 2016, the female sample (n=124) had a mean of 1406.79 and (SD = 179.17) while the male sample (n = 123) with a mean = 1380.55 and (SD = 203.56). In 2017, the female sample (n=124) had a mean of 1497.65 and (SD= 181.84) while the male sample (n=123) with a mean of 1451.89 and (SD= 219.90).

For the month of September, the male sample (n = 121) had a mean of 1782.72 and (SD =200.58) while the female sample (n=122) had a mean of 1818.40 and (SD= 151.69). For the month of May, the male sample (n=121) had a mean of 1866.70 and (SD=221.31) while the female sample (n=120) with a mean of 1926.80 and (SD= 153.13).

Table 21. Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Diff. Low	Up.	Std. Error Diff	95% Confidence Interval
2016 Scale	Equal variances assumed	.253 .	.616	-1.094	245	.275	-26.245	23.982	-73.483	20.9927
	Equal variances not assumed			-1.094	237.804	.275	-26.245	23.998	-73.522	21.0317
2017 Scale	Equal variances assumed	.482	.488	-1.783	245	.076	-45.759	25.666	-96.314	4.7962
	Equal variances not assumed			-1.781	235.957	.076	-45.759	25.686	-96.362	4.844
Score/Sept	Equal variances assumed	5.249	.023	-1.565	241	.119	-35.681	22.801	-80.597	9.235
	Equal variances not assumed			-1.563	223.450	.119	-35.681	22.827	-80.666	9.303
Score/May	Equal variances assumed -	8.428	.004	-2.450	239	.015	-60.099	24.534	-108.431	-11.767
	Equal variances not assumed			-2.453	213.618	.015	-60.099	24.498	-108.390	-11.809

Overall results for this study the 2016 Scaled Score Variances were not significant for September through April, however, in May the variances were significant as noted in Table 21.

In 2016 scale equal variances had a mean of .275, df = 245, and *t* = -1.094. In 2017, Scale Score equal variances had a mean of .076, df =245, and *t* = -1.783. Index scores for *Istation* in

September had a mean of 119, df = 223.45, and *t* = -1.563. The Index Scores for *Istation* in May had a mean of .015, df = 213.62, and *t* = -2.453.

Research Question 4

RQ4: Is there a significant difference in STAAR Reading scaled scores between at-risk and non-at-risk students who participated in the *Istation* Advanced Reading Program at the end of the 9-month Istation program?

An independent-samples *t*-test was conducted to evaluate whether the means of reading scaled scores on the 2017 STAAR Reading Test differed between at-risk and non-at-risk students who participated in the intervention program *Istation* Advanced Reading Program at the end of the program.

Table 22. *ANOVA*

		Sum of Squares	df	Mean Square	F	Sig.
Score/Sept	Between Groups	299810.634	2	149905.317	4.906	.008
	Within Groups	7303254.635	239	30557.551		
	Total	7603065.269	241			
Score/May	Between Groups	85831.729	2	42915.864	1.161	.315
	Within Groups	8799614.273	238	36973.169		
	Total	8885446.002	240			

ANOVA was used for the three groups as Independent Variable. Rate of Improvement (ROI) was measured as low, intermediate and advanced high on the Dependent Variable on the *Istation* scores in Sept and May.

Multiple Comparisons

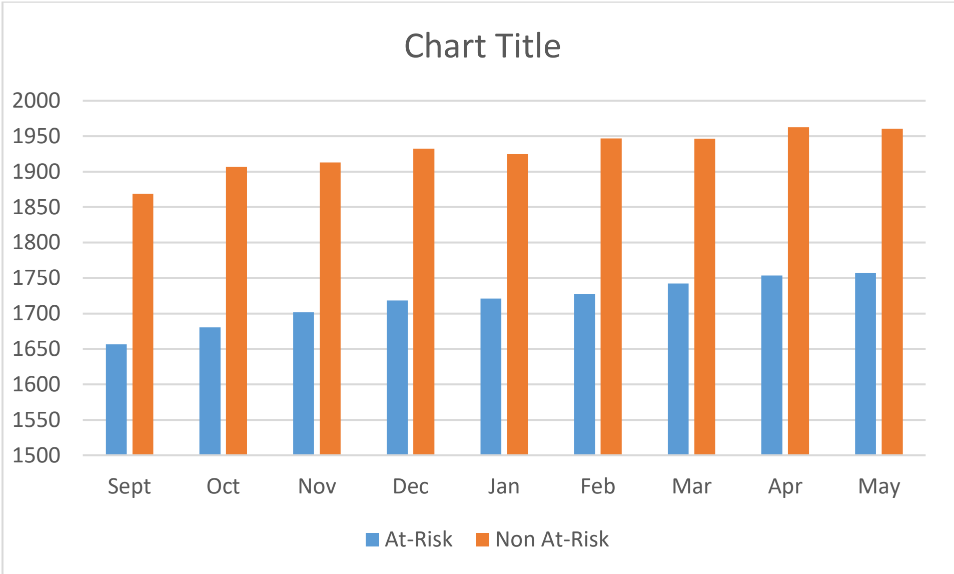
Table 23. Scheffe

Dependent Variable	(I) ROInew	(J) ROInew	Mean Difference (I-J)	Std. Error	Sig	95% Confidence Interval	
						Lower Bound	Upper Bound
Score/Sept	1.00	2.00	67.36271140*	24.60538213	.025	6.7555258	127.9698970
		3.00	77.70580494	32.61704225	.061	-2.6354441	158.0470540
	2.00	1.00	-67.36271140*	24.60538213	.025	-127.969897	6.7555258
		3.00	10.34309354	33.29575454	.953	-71.6699378	92.3561248
	3.00	1.00	-77.70580494	32.61704225	.061	-158.0470540	2.6354441
		2.00	-10.34309354	33.29575454	.953	-92.3561248	71.6699378
Score/May	1.00	2.00	-20.62494985	27.25994492	.751	-87.7725447	46.5226450
		3.00	-53.18606966	35.31753463	.323	-140.1813850	33.8092457
	2.00	1.00	20.62494985	27.25994492	.751	-46.5226450	87.7725447
		3.00	-32.56111981	36.04643636	.665	-121.3518899	56.2296503
	3.00	1.00	53.18606966	35.31753463	.323	-33.8092457	140.1813850
		2.00	32.56111981	36.04643636	.665	-56.229650	121.3518899

The mean difference is significant at the 0.05 level.

Figure 1. *Istation Rate of Improvement*

Index Scores



Discussion

For this study, closing ROI gap is of paramount importance for the comparison groups. In September 2016, there was a significant difference between the ROI low responders and the ROI intermediate responders. However, the big difference was between the ROI low responders and the ROI advanced responders. In May 2017, there is no difference between the Reading scores. This is good because it is evidence that the treatment helped in closing the reading achievement gap for the struggling fourth grade readers.

Rates of Improvement (ROI)

Table 24. *ANOVA (Istation Rate of improvement for Index Scores)*

		Sum of Squares	df	Mean Square	F	Sig
Score/ May	Between Groups	85831.729	2	42915.864	1.161	.315
	Total	8885446.002	240	36973.169		
	Between Groups	299810.634	2	149905.317	4.906	.008
	Within Groups	7303254.635	239	30557.551		
	Total	7603065.269	241			

ROI = Low, Moderate and High

There is a significant group difference in *Istation* scores in September across the three ROI groups (F (2,239) = 4.91, p = .008). There is no group difference in *Istation* scores in May across the three ROI groups (F (2,238) = 1.16, p = .315).

Post-hoc Scheffe test revealed that Correlations show those that have higher improvement rate also perform better in 2016 scale and 2017 scale; and May *Istation.* Those who passed third are also more likely to pass fourth. There was no significant correlation between usage time and other variable.

Research Question 5

RQ5. Is the *Istation* Usage Time significant for the male and female students using the *Istation* Advanced Reading Program?

For the Istation usage time measure, there was no significant difference in usage time between male and female students. In Table 25, we can see the Male sample (n=123) had a mean of 1313.69 and a (SD = 458.60) as compared to the female sample (n= 124) with a mean of 1319.79 and a (SD = 429.61).

Table 25. *Istation-Time Usage*

Group Statistics

Usage Time	Gender	N	Mean	Std. Deviation	Std. Error Mean
	M	123	1313.6863	458.60463	41.35099
	F	124	1319.7873	429.61008	38.58012

In Table 26 with the Independent Samples Test with equal variances assumed, there is a significant difference in usage time as reported between males and females who used the *Istation* Advanced Reading Program.

Table 26. *Independent Samples Test*

Independent Samples Test

		Levene's Test for Equality of Variances		*t*-test for Equality of Means					
		F	Sig	t	df	Sig. (2 tail)	Mean Dif	Std. Error Dif. Upper	95% Conf Interval Lower
Usage Time	Equal variances assumed	.554	.457	-.108	245	.914	-6.10100	56.53879	-117.46511
	Equal variances not assumed			-.108	243.690	.914	-6.10100	56.55378	117.49761

For the *Istation* usage time measure, there was no significant difference in usage time between LEP and Non-LEP students. In Table 27, we can see the LEP sample (n=55) had a mean of 1335.70 and a (SD = 427.16) as compared to the Non LEP sample (n= 192) with a mean of 1311.32 and a (SD = 448.87).

Table 27. *Group Statistics*

	LEP	N	Mean	Std. Deviation	Std. Error Mean
Usage Time	Y	55	1335.7049	427.1650	57.5989
	N	192	1311.3192	448.8716	32.3945

In Table 28, the scale score equal variances assumed had a mean of .24.38, df = 245, and *t* =.359. For the Equal Variance not assumed scale score variance had a mean of .24.38, df =90.00, and *t* = .369. Usage time between LEP and Non-LEP was not significant.

Table 28. *Independent Samples Test*

		Levene's Test for Equality of Variances					*t*-test for Equality of Means			
		F	Sig	t	df	Sig. (2 tail)	Mean Dif Up.	Lower	Std. Error Dif	95% Conf Interval
Usage Time	Equal Variances Assumed	.100	.752	.359	245	.720	24.385	67.931	-109.419	158.190
	Equal Variances Not assumed			.369	90.991	.713	24.385	66.083	-106.881	155.652

In Table 29, there was no significant difference between migrant and Non-Migrant students. We can see that the migrant sample (n=12) had a mean of 1268.799 and a (SD=454.54) as compared to the Non-Migrant sample (n=235) with a mean of 1319.20 and a (SD=443.67).

Table 29. *Group Statistics*

	Migrant	N	Mean	Std. Deviation	Std. Error Mean
Usage Time	Y	12	1268.7892	454.54842	131.21682
	N	235	1319.1982	443.66781	28.94170

In Table 30, the scale equal variances assumed had a mean of .24.3, df = 245, and *t* =.359. For the Equal Variance not assumed scale score variance had a mean of .24.38, df = 90, and *t* = .369.

Table 30. *Independent Samples Test*

		Levene's Test for Equality of Variances		*t*-test for Equality of Means						
		F	Sig	t	df	Sig. (2 tail)	Mean Dif	Std. Error Dif	95% Interval Up.	Low
Usage Time	Equal variances assumed	.097	.755	-.383	245	.702	-50.409	131.451	309.328	208.510
	Equal variances not assumed			-.375	12.095	.714	-50.409	134.3706	-342.922	242.104

Table 31. *ANOVA*

Usage Time

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	144121.203	2	72060.602	.374	.689
Within Groups	46867472.307	243	192870.256		
Total	47011593.510	245			

In Table 32, there was no significant difference in usage time Among the three ROI groups. The three ROI groups were the low responders (1.00), the moderate responders (2.00), and the advanced responders (3.00). The Scheffe Test is a post-hoc test used to make unplanned comparisons rather than planned comparisons among group means in an analysis of variance (ANOVA) experiment.

Table 32. *Multiple Comparisons*

Dependent Variable: UsageTime

Scheffe

Dependent Variable	(I) ROInew	(J) ROInew	Mean Diff. (I-J)	Std. Error	Sig	95% Conf. Interval	
						Lower	Upper
	1.00	2.00	53.0184	61.510	.690	98.477	204.514
		3.00	29.501	80.358	.935	-168.414	227.418
	2.00	1.00	-53.0184	61.510	.690	-204.514	98.477
		3.00	-23.516	82.063	.960	-225.630	178.598
	3.00	1.00	-29.501	80.3586	.935	-227.418	168.414
		2.00	23.516	82.063	.960	-178.598	225.630

In the 2017 Scale Pearson Correlation, there is a significant correlation at the 0.01 level (2-tailed) as evident in Table 33. Correlation is also significant at the 0.05 level (2-tailed)

Table 33. *Correlations*

			2016 Scale	2017 Scale	PassThird	PassFourth	Score/Sept	Score/May	UsageTime	ROInew	ImprovRate
2016 Scale	Pearson Correlation		1	.884**	.507**	.408**	.737**	.742**	.110	-.079	.137*
	Sig. (2-tailed)			.000	.000	.000	.000	.000	.085	.216	.035
	N	247	247	247	247	243	241	247	246	237	
2017 Scale	Pearson Correlation		.884**	1	.385**	.491**	.742**	.771**	.101	-.046	.207**
	Sig. (2-tailed)		.000		.000	.000	.000	.000	.113	.475	.001
	N	247	247	247	247	243	241	247	246	237	
PassThird	Pearson Correlation		.507**	.385**	1	.660**	.557**	.490**	-.033	-.070	-.092
	Sig. (2-tailed)		.000	.000		.000	.000	.000	.608	.273	.157
	N	247	247	247	247	243	241	247	246	237	
PassFourth	Pearson Correlation		.408**	.491**	.660**	1	.530**	.518**	-.037	-.013	.064
	Sig. (2-tailed)		.000	.000	.000		.000	.000	.566	.845	.325
	N	247	247	247	247	243	241	247	246	237	
Score/Sept	Pearson Correlation		.737**	.742**	.557**	.530**	1	.889**	.097	-.184**	-.116
	Sig. (2-tailed)		.000	.000	.000	.000		.000	.133	.004	.075
	N	243	243	243	243	243	237	243	242	237	
Score/May	Pearson Correlation		.742**	.771**	.490**	.518**	.889**	1	.078	.097	.348**
	Sig. (2-tailed)		.000	.000	.000	.000	.000		.230	.132	.000
	N	241	241	241	241	237	241	241	241	237	
UsageTime	Pearson Correlation		.110	.101	-.033	-.037	.097	.078	1	-.038	.078
	Sig. (2-tailed)		.085	.113	.608	.566	.133	.230		.557	.231
	N	247	247	247	247	243	241	247	246	237	
ROInew	Pearson Correlation		-.079	-.046	-.070	-.013	-.184**	.097	-.038	1	.551**
	Sig. (2-tailed)		.216	.475	.273	.845	.004	.132	.557		.000
	N	246	246	246	246	242	241	246	246	237	
ImprovRate	Pearson Correlation		.137*	.207**	-.092	.064	-.116	.348**	.078	.551**	1
	Sig. (2-tailed)		.035	.001	.157	.325	.075	.000	.231	.000	
	N	237	237	237	237	237	237	237	237	237	

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Overall Results for Research Questions

In order to compare the 2016 and the 2017 Scaled Scores on their STAAR Reading Test, a paired sample *t*-test was conducted. There were 247 participants in this sample. In 2016, the Scaled Scores had a mean of 1393.79 and (SD= 118.99). In 2017, the scaled scores had a mean of (SD= 142.11). There is a statistical significance between the means with 13.8 degrees of freedom, 2000, p< 0.001. The 2017 scaled scores are significantly higher than the 2016 scaled scores (p = -13.38), degrees of freedom 246, p < 0.001.

First, to compare their scores in September and in May on *Istation* Advanced Reading program, a pair of t-tests was performed. A score of mean, SD, degrees of freedom 236, and p< .001. Therefore, there is a significant increase in these two-scaled scores.

Secondly, to compare two different groups to determine if there were differences, between Group I which were the at-risk student sample and Group II which is the non-at-risk student sample, we performed independent sampled *t-tests*. The mean for Group I was 13.691 and 18.274 for Group II.

There is a significant difference between these two groups showing that the (non-at-risk) group performed a lot better on this scaled test by 167.59. What is interesting is that the non-at-risk performed better. The mean score for this group was (p= -6.654) with the degrees of freedom 235, and p < .001. Thirdly, to find a significant predictor that may contribute to our criterion variable which is the 2017 STAAR Test score a multiple regression was performed.

The dependent variable being the 2017 Scaled Scores in predicting variables being scores, time usage, and 2016 Scaled Scores. The model was significant: adjusted are r-squared equals .796, indicating that any percent of the variances in the 2017 Scaled Scores can be explained by the model. Where $S= 474.3$, degrees of freedom 238, $p<.001$. Both 2016 and 2017 Scaled Scores for STAAR Reading are significant predictors ($t =15.496$, $p < .001$) and ($t = 6.26$, $p < .001$) respectively. There are no collinearity issues, as we checked for this issue by the affected regression model.

There is a significant difference between these two groups showing that the non-at-risk group performed a lot better on this kind of test by $t = 167.59$, degrees of freedom 254. One score is significantly higher than the other score, $t = -6.54$, degrees of freedom 245, $p < 0.001$. What is interesting is that one group outscored the other group. Criterion variable being the 2017 scaled score. Multiple regression analysis indicated that any percent of the variances in the 2017 scores can be explained by the model.

The following tables depict the change in STAAR reading scores with percentage scores derived from the scaled scores for the school years 2015-2016 and 2016-2017. STAAR Reading Scores were disaggregated for the three participating school campuses. See (Tables 6 and 7).

Individual Campus STAAR Results

The rural South Texas school district provided their own data results for this study from their PEIMS and Curriculum office. In Tables 6 and 7, the school district provided data on the demographics of the student population and their testing percentages. Table 5 provides percentages based on gender, economic and migrant status, and the special populations.

District-wide the 2015-2016 STAAR Reading Scores demonstrate that overall the school district needs to address the reading and learning gaps for all the third grade readers which includes the at-risk students. The district decided to use a reading intervention to address all the readers for the following school year.

Table 34. *STAAR Reading Results Per Campus (2015-2016)*

Campus	Test	All	Male	Female	Eco	Migrant	LEP	SPED
School A	3rd Reading	69%	66%	72%	66%	25%	35%	40%
School B	3rd Reading	72%	68%	75%	68%	50%	64%	25%
School C	3rd Reading	56%	64%	49%	58%	50%	52%	25%
District-Wide	3rd Reading	66%	66%	66%	64%	42%	50%	31%

Table 35. *STAAR Reading Results Per Campus (2016-2017)*

Campus	Test	All	Male	Female	Eco	Migrant	LEP	SPED
School A	4th Reading	78%	72%	85%	78%	25%	53%	36%
School B	4th Reading	69%	68%	70%	65%	50%	71%	0%
School C	4th Reading	60%	66%	53%	59%	50%	40%	13%
District-Wide	4th Reading	70%	69%	70%	68%	40%	50%	20%

Table 34 contains the reading results per campus for the same students from the previous school year. These former third grade students tested on their STAAR Reading Test in 2016-207. They were all promoted to the next level with individual and unique scores and academic needs. Overall, the STAAR Reading Scores did improve for the whole district during the 2016-2017 academic school year. The researcher goes on to provide data on the *Istation* Reading Program rates of improvement for the current school year

Istation Rates of Improvement and Index Scores

According to the *Istation* Summary Reports and the Rate of Improvement (ROI), the fourth-grade at-risk students demonstrated a consistent increase in their Index scores from September 2016 (value of 1656.51) to May 2017 (value of 1757.12). This increase in scores was 100.61 index points as noted in Figure 1.

To supplement the information gained from the 2016-2017 outcomes, a brief snap shot of the current *Istation* Index reading scores was examined. This chart (Fig. 1) displays the monthly Index Scores for both tested groups. The fourth- grade non- at-risk students also demonstrated a significant amount of improvement. For the month of September, they scored at the 1868.75 Index score. However, in May of 2017, they scored at 1960.42. These students had an increase of 91.67 in their index scores.

Table 36. *Istation Rate of Improvement (Monthly)*
Index Scores

Month	Non At-Risk	(SD)	At-Risk	(SD)
September	1868.75	150.33	1656.51	153.91
October	1906.87	145.71	1680.47	189.23
November	1912.83	133.24	1701.66	156.23
December	1932.40	149.58	1718.49	167.56
January	1924.59	147.49	1721.01	192.30
February	1947.02	156.53	1727.25	159.68
March	1946.52	155.95	1742.05	196.94
April	1962.90	176.26	1753.48	155.18
May	1960.42	169.83	1757.12	152.01

In Table 36, when we look at the monthly Index Scores, we can see a continuous increase in small but steady increments. It is obvious that the non-at-risk students have higher Index Scores that do the at-risk students for the duration of the study, however, both groups demonstrated increased scores except for the month of May. In May, the non-at-risk students decreased by 2.48 percentage points. The reason is unknown for this unexpected change. However, for the same month, the at-risk students increased on their percentage points by 3.64 points.

Table 37 depicts the actual rates of improvement and its validity with the three different groups of learners. Some students demonstrated high scores while others demonstrated moderate to low gains in their reading progress while using the *Istation* reading intervention

Table 37. *Rate of Improvement Across Groups (ROI)*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		2	.8	.8	.8
	High	41	16.5	16.5	17.3
	Low	110	44.2	44.2	61.4
	Moderate	95	38.2	38.2	99.6
	N/A	1	.4	.4	100.0
	Total	249	100.0	100.0	

It is interesting to note when student groups were compared to each other, there was no comparison because the non-at-risk students scored much higher in the month of September as compared to the at-risk students. Non at-risk students scored at 1868.75 and the at-risk students scored at 1656.51 which translates to a difference of 212.24 in their index scores baseline which was much longer for the at-risk student group which consisted of many second language learners labeled as English Language Learners (ELLs).

In Table 38, the research data indicates that the standard deviation for the 2016 Scaled Reading Scores is lower than the 2017 Scaled Reading Scores. Lower standard deviation scores are measures of significant growth or progress for the English First Learners (EL) [203.96 – 217.03 = -13.07] and the second language learners known as the English Language Learners (ELLs) had the standard deviation scores of [142.11 – 118.99 = -23.12]

Table 38. *Group Statistics (LEP)*

	LEP	N	Mean	Std. Deviation	Std. Error Mean
2016 Scale	Y	55	1371.818	118.986	16.044
	N	192	1399.995	203.958	14.719
2017 Scale	Y	55	1464.091	142.105	19.161
	N	192	1477.943	217.034	15.663
Score/Sept	Y	55	1768.880	162.998	21.978
	N	188	1809.917	181.835	13.261
Score/May	Y	54	1857.883	177.105	24.100
	N	187	1907.81	195.632	14.300

For this study, the one-way analysis of variance (ANOVA) is used to determine whether there are any significant differences between the means of two or more independent groups. By definition: the ANOVA is a statistical procedure for testing variance among the means of two or more groups. Such an estimate is called between-groups estimate of the population variance.

This research method allows you to use the F Ratio which is the variance that determines if something really happened in the acceptance or rejection of the Null Hypothesis. If the null hypothesis is not true, the populations themselves do have the same mean.

In Table 39, we used the one-way analysis of variance (ANOVA) because we had more than two schools to compare. We can see that the scores between the groups indicate the decrease in the Sum of Squares which indicates an improvement within the groups.

Table 39. *ANOVA*

		Sum of Squares	df	Mean Square	F	Sig.
2016 Raw	Between Groups	69.003	2	34.501	.490	.613
	Within Groups	17120.395	243	70.454		
	Total	17189.398	245			
2016 Scale	Between Groups	124722.002	2	62361.001	1.761	.174
	Within Groups	8606954.750	243	35419.567		
	Total	8731676.752	245			
2017 Raw	Between Groups	21.223	2	10.612	.184	.832
	Within Groups	14017.578	243	57.686		
	Total	14038.801	245			
2017 Scale	Between Groups	78706.436	2	39353.218	.957	.385
	Within Groups	9988178.573	243	41103.616		
	Total	10066885.010	245			
Score/Sept	Between Groups	299810.634	2	149905.317	4.906	.008
	Within Groups	7303254.635	239	30557.551		
	Total	7603065.269	241			

Score/May	Between Groups	85831.729	2	42915.864	1.161	.315
	Within Groups	8799614.273	238	36973.169		
	Total	8885446.002	240			

In Table 40 we conducted the *t-test* for equality of means. The table depicts the mean differences between the Scaled Reading scores for 2016 and 2017 respectively. We assume equal variances to determine the growth in reading skills for both the STAAR Reading scores and the *Istation* monthly Index scores for the comparison groups.

Table 40. *Independent Samples Test*

		T-test for Equality of Means			
		t	df	Sig. (2 tailed)	Mean Diff.
2016 Scale	Equal variances assumed	-5.110	160	.000	-141.043
	Equal variances not assumed	-5.971	98.587	.000	-141.043
2017 Scale	Equal variances assumed	-3.616	160	.000	-118.572
	Equal variances not assumed	-4.098	123.604	.000	-118.572
Score/Sept	Equal variances assumed	-5.212	158	.000	-130.668
	Equal variances not assumed	-5.624	156.387	.000	-130.668
Score/Oct	Equal variances	-4.691	157	.000	-133.868

	assumed				
	Equal variances not assumed	-5.172	145.948	.000	-133.868
Score/Nov	Equal variances assumed	-4.813	158	.000	-119.651
	Equal variances not assumed	-5.117	157.391	.000	-119.651
Score/Dec	Equal variances assumed	-3.889	157	.000	-106.863
	Equal variances not assumed	-4.101	156.876	.000	-106.863
Score/Jan	Equal variances assumed	-3.998	160	.000	-113.418
	Equal variances not assumed	-4.316	155.011	.000	-113.418
Score/Feb	Equal variances assumed	-4.297	160	.000	-111.283
	Equal variances not assumed	-4.654	153.761	.000	-111.283
Score/ March	Equal variances assumed	-3.689	160	.000	-109.301
	Equal variances not assumed	-3.966	156.470	.000	-109.301
Score/Apr	Equal variances assumed	-4.160	156	.000	-116.459
	Equal variances not assumed	-4.417	154.342	.000	-116.459
Score/May	Equal variances assumed	-4.160	156	.000	-116.459
	Equal variances	-4.417	154.342	.000	-116.459

not assumed

In Table 41, we see another important test of differences known as the *t*-test for paired samples. This test is also known as a *t*-test for repeated measures or a *t*-test for matched samples. Whenever two distributions of a dependent variable are highly correlated, it is because they are distributions of pre and post tests for the same group of students.

Table 41. *Paired Samples Statistics (T-Test)*

group	1=unsatisfactory ;2=satisfactory; 3=advanced		Mean	N	Std. Deviation	Std. Error Mean
1.00	Pair 1	2016 Scale	1258.883	94	225.630	23.272
		2017 Scale	1364.149	94	258.453	26.657
	Pair 2	2016 Raw	17.245	94	7.3845	.761
		2017 Raw	18.106	94	7.602	.784
	Pair 5	Score/Sept	1687.911	92	172.039	17.936
		Score/May	1778.488	92	200.737	20.928
2.00	Pair 1	2016 Scale	1399.926	68	33.379	4.047
		2017 Scale	1482.721	68	92.719	11.243
	Pair 2	2016 Raw	25.074	68	2.599	.315
		2017 Raw	23.044	68	5.538	.671
	Pair 5	Score/Sept	1812.627	64	113.937	14.242
		Score/May	1904.561	64	120.5135	15.064
3.00	Pair 1	2016 Scale	1537.871	85	73.7428	7.998
		2017 Scale	1591.000	85	109.3493	11.860
	Pair 2	2016 Raw	33.059	85	2.5558	.277
		2017 Raw	28.318	85	4.9981	.542
	Pair 5	Score/Sept	1927.418	81	119.0403	13.226
		Score/May	2024.532	81	142.8407	15.871

Chapter Summary

This research was intended to add to the body of knowledge regarding students who are struggling with their reading skills in the fourth-grade. Data was collected from the subgroups and analyzed with SPSS to determine the effectiveness of the reading intervention.

In summary, this study examined the reading achievement of those fourth-grade students labeled as At-Risk, Non-at-Risk, Migrant vs Non-Migrant, LEP v Non-LEP, gender roles, and time usage spent on the *Istation* Advanced Reading Program. In reviewing the data, this study has shown evidence that reading rates of improvement were positive, especially in the month of April and May 2017. The analysis of covariance (ANCOVA) focused on the posttest differences between the treatment groups while holding constant any differences in the pretest scores. But the analysis of covariance does not tell you anything about how the groups changed from pretest to posttest. As such, we had to use the independent *t-tests* for analysis of the descriptive statistical data.

Analysis of variance (ANOVA) results did show a statistically significant gain in test scores after *Istation* was implemented. The researcher recommends this study to be considered a pilot and a continued study. Quantitative data demonstrated statistically significant differences for the *Istation* assessments and *Istation* usage times. Progress demonstrated by the fourth-grade at-risk students on the ISIP Index Reading scores indicated learning progress. A student's learning progress within a school year represents learning gain (Mahoney, 2006).

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CHAPTER V

SUMMARY, CONCLUSIONS, AND DISCUSSIONS

Overview

This study was a first step toward understanding the impact of computerized reading instruction on student reading achievement throughout the South Texas Title 1 school district. The purpose of this research was to analyze the impact of *Istation* on at-risk fourth grade students' reading scores to see whether the *Istation* intervention had any impact as measured after two semesters (8 months) of treatment. The study was performed using archived data from two variables, the *Istation* (ISP) and scaled STAAR Reading assessment scores (testing done in May 2017) after treatment to determine whether *Istation* intervention during daily reading instruction helped increase the reading scores of fourth grade at-risk students.

In Texas, the Texas Students Using Curriculum Content to Ensure Sustained Success (SUCCESS) student initiative provides state-funded access to interactive mathematics and reading programs for Texas public school students in grades three through eight (Garland, Shields, Booth, Shaw & Shamii-Shore, 2015). The *Istation* Adaptive Curriculum resulted in better outcomes for struggling readers when measured by the State of Texas Reading Assessment (STAAR). All students got reading support because the school district identified a deficit in the area of reading comprehension across all grade levels. Thereby, in an effort to narrow the reading achievement gap for the elementary upper grade levels educational technology was used as the medium to deliver supplemental reading programs.

The United States Department of Education stated that 32% of fourth-grade students did not meet the fundamental reading or proficient level on a recent nationwide test (National Center for Education, 2013). Students and teachers across Texas districts are being held accountable for standards in all educational subjects and levels. Literacy is one such standard on which students are tested every year starting at a very early age (TEA, 2015). There is no question that technology will be part of future solutions to the problems of reading difficulties in elementary schools starting in first grade.

With further research, many intervention programs like those reviewed by researchers like Slavin & Cheung (2012) will serve as the basis for further development of impactful models. Interestingly, five years ago, researchers Slavin & Cheung (2012) made the observation that approaches using technologies were becoming commonplace in elementary schools, such as interactive white-boards, electronic response devices, laptops, and other devices for all students, had not yet been adequately researched for struggling readers, but could hold great promise.

The findings in-regard-to the effectiveness of the computer-assisted instructional program (*Istation*) were promising. The analyses showed that both groups had similar gains in academic achievement, specifically in reading comprehension. These findings go hand-in-hand with the premise that technology impacts student learning. According to the Center for Applied Research in Educational Technology (CARET): (1). "Technology improves student performance when the application directly supports the curriculum objectives being assess."

(2). "Technology improves performance when the application adjusts for student ability and prior experience and provides feedback to the student and teacher about student performance or progress with the application."

(3). "Technology improves performance when the application is integrated into the typical instructional day."

Technology serves as a bridge to more engaging, relevant, meaningful, and personalized learning, all of which can lead to higher academic achievement (Smith & Throne, 2007). Furthermore, they stated that technology provides a platform for using timely and relevant data to shape personalized learning.

Conclusions drawn from this study reveal three primary reasons that multimedia and technology are effective in the classroom:

(1). Multimedia and technology use engage students, which in turn leads to students who are more attentive, knowledgeable, and higher achieving.

(2). Multimedia and technology use leads to teachers who are better prepared and more effective.

(3). Multimedia and technology use in the classroom changes the nature of interaction in ways that help students learn.

The *Istation* Advanced Reading Program is a reading program that incorporates all the designs of multimedia learning and formative assessments for monitoring student academic growth. Formative assessment is the practice of assessing students' current knowledge and proficiency for the purpose of deciding what future learning opportunities should be offered (in contrast to assessments to certify what has been learned).

The assessment items most commonly used in school focus on right or wrong answers, and technology-based assessment can be designed to give immediate feedback (right or wrong) for such items. But technology can move well beyond these basics in providing feedback:

technology-based feedback can include providing worked examples, modeling how to solve a problem, and guiding a student through the steps of problem solving.

In a recent review of reading interventions in Florida, Crawford & Torgeson (2006) reported the following features of effective scientifically-based reading intervention programs:

- Differentiated materials;
- A set of scope and sequence;
- Different components of reading; and
- Technology-based reinforcement.

Conclusions

Preventing reading failure and providing reading intervention are the top priorities for education. Federal legislation has created funding streams for schools to improve student reading achievement. The *Istation's* Indicators of Individual Progress (ISIP) provided an empirical evaluation of each students' individual responses to different interventions to identify the most effective course of action. The *Istation*'s (ISIP) is a concise and an easily interpreted tool for making instructional decisions for struggling readers. *Istation's* ISIP demonstrated its effectiveness in identifying students in need of more effective interventions as well as guiding the selection of more effective (i.e., intensive) interventions for them.

Educational technology can be used to enhance a reading program and its interventions to benefit the struggling elementary upper grade readers. Research indicates that many struggling readers do understand how to monitor their comprehension, and use few or limited reading strategies (USDE, 2015). The ISIP Reading curriculum which is part of the *Istation* Advanced Reading software application does help these students improve their reading growth.

The value of data as a tool for informing instructional progress is well-established and educators know that predictive analytics can identify problem areas, shape intervention strategies and helps move students toward learning goals, but to achieve this, certain challenges must be overcome, a supportive culture must be sustained throughout the process.

In example, Patarapichayatham, Fahle, and Roden (2014) studied the relationship of between ISIP Reading and STAAR reading data and found that the ISIP end-of-year (EOY) scores were higher than the middle-of-the-year (MOY) scores for both the overall scores and sub-skill scores across grades, indicating that students' reading ability improved through the year. The very strong correlations between ISIP reading and STAAR reading test scores across grades indicated that students who perform well on ISIP Reading are likely to perform well on the STAAR reading assessment. The researchers also found that the ISIP Reading measures are highly predictive of STAAR reading scores.

Comprehension is the ultimate goal of reading, yet it prominently difficult to teach. Multimedia environments can mirror and reinforce proven teacher-led strategy instruction through the use of pop-ups, linked questions, online resources, and animated reading coaches or e-tutors who engage in questioning, prompts, and think alouds.

In our schools, struggling readers' comprehension is often impaired by a limited reading vocabulary. Multimedia texts with supports for vocabulary development can help these students achieve their reading goals and improve comprehension. Additionally, when teachers are aware of what they are teaching, they need to find materials that are of interest to their students (Klinger et al., 2010). Thus, reading something of interest will intrinsically motivate the child to want to read and therefore will do better when learning new comprehension strategies (Stuz, Schaffner, and Schiefele, 2016).

Discussion

The goal of basic research is to contribute a theory of learning (i.e., science of learning) whereas the goal of applied research is to derive principles of instructional design (i.e., science of instruction); merging these goals results in basic research on applied situations where the goal is to derive principles of multimedia design that are both grounded and supported by empirical evidence (Mayer, 2009).

The primary goal of investigating the impact of the *Istation* Advanced Reading Program on the reading achievement of fourth-grade at-risk and non-at-risk students was met with limited success, but it had a significant effect on the improvement of students' literacy skills and their performance on state-mandated reading assessments. Thus, technology in the classroom can and does help struggling readers.

In this study, I discovered the principle known as the "multimedia principle" which states that "people learn more deeply from words and pictures than from words alone." However, simply adding words to pictures is not an effective way to achieve multimedia learning. The goal is to use instructional media in the light of how the human mind works (Mayer, 2014).

The case for multimedia learning rests on the premise that learners can better understand an explanation when it is presented in words and pictures, rather than, when it is presented in words alone (Mayer, 2009). Multimedia is a presentation consisting of: on-screen text; on-screen graphics or animation; and sounds coming from the computer speakers (audio system). The rational for multimedia presentations is that it takes advantage of the full capacity of humans for processing information.

Multimedia can be viewed as response strengthening (in which multimedia environments are used as drill-and-practice systems), information acquisition (in which multimedia messages serve as information delivery vehicles), or as knowledge construction (in which multimedia messages include aids to sense-making) (Mayer, 2009).

Limitations of the Study

Because participants in this study were not randomly selected but were instead part of a cohort, the generalizability of the results to similar populations is lower than if the sampling process had been completely random. Generalizability may also be limited by the fact that all of the participating students were in the fourth grade at a South Texas Independent School District and in Title 1 campuses.

Implications of the Study

This study was designed and conducted in accordance with criteria specified in the No Child Left Behind Act's (2002) definition of scientifically based research. With instructional technology playing a more centralized role in all academic areas, more research, and more effective approaches are needed to document student achievement related to computer-based learning and educational programs (U.S. Department of Education, 2005).

This study adds to the body of scientifically-based research literature on student achievement directly linked to the use of educational software. Researchers describe a compelling need for research in the area of student achievement and learning that is directly attributed to educational technological innovations.

In the current study, the data suggest that the use of a software program affected student achievement scores on a standards-based, multiple choice test, however, many questions about the effects of educational software on student learning remain unanswered. Based on the current research, we can conclude that further research is needed to examine the effects of the *Istation* comprehension interventions on broad comprehension outcomes with standardized measures like the STAAR Reading Assessment. Furthermore, additional work is needed to determine the effects of this intervention for upper elementary students (i.e., fifth and sixth grade levels) at our school district with more parametric statistics (Salkind, 2014). In this study, only the fourth-grade students were evaluated and monitored for the duration of the study.

Future Research and Recommendations

To increase the ability to generalize findings, future researchers may want to use a larger sample size, include other grade levels, and different types of school districts, or study specific populations (i.e., economically disadvantaged or English Language Learners. The researcher E.D. Hirsh (2003) states, "we're finding that even though the vast majority of our youngest readers can manage simple texts, many students-particularly those from low-income families-struggle when it comes time in grade four to tackle more academic texts," (p. 10).

When instructional designers create instructional programs with embedded multimedia (like the *Istation* Advanced Reading Program and others) consideration should be taken with the cognitive processes and concept of cognitive overload in which the learner's intended cognitive processing exceeds the learner's available cognitive capacity (Mayer & Moreno, 2003).

Further research should include a longitudinal study across several years to investigate the real impact of the *Istation* reading program on student growth. This study could become that longitudinal study with the factors of predictability and student growth over three years of data collection

Despite the limitations and suggestions for improvement, this study provided important evidence supporting the effectiveness of the *Istation* Advanced Reading software program with the small sample of fourth grade at-risk students. Effective reading interventions that are scientifically-based are needed, in order, to improve instruction for struggling readers. However, computer-based programs are not intended to be a "stand alone" programs. Grenawalt (2004) recommends the importance of combining reading skills instruction with a computer-based reading program with a balanced literacy program to improve learning.

In summary, evidence suggests that educational technologies can improve student achievement, as long as such tools are integrated thoughtfully and with fidelity into teaching and learning. I agree with the statement that when digital capabilities (such as engaging online environments) are incorporated meaningfully into instruction, students have new opportunities to learn and to achieve (U.S. Department of Education, Office of Educational Technology, 2010).

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APPENDIX A

APPENDIX A

ISTATION PARENT LETTER (SAMPLE)

Dear Parents:

We would like to take a moment to tell you about a supplemental reading program at our school, the ***istation*** *Reading Program*!
istation is an internet-based reading intervention program for use by students in grades Pre-K through 12. ***istation*** is made of four easy-to-use components that work together to help students achieve success in reading.

1. Assessments Identify Areas in Need of Improvement.
Students' skills are assessed and monitored throughout the year using ***istation's*** Indicators of Progress (ISIP™), a fast, online assessment. The assessment determines where students have weaknesses in the critical areas of reading.

2. Individual Instruction is Delivered in a Fun, Animated Format.
Based on assessment results, students then receive instruction based on their individual needs through ***istation's*** online interactive curriculum. The interactive reading curriculum provides instruction and practice in all of the critical reading areas. Students receive this instruction in a fun, animated format that motivates students to learn.

3. Student Improvement is Monitored Closely.
Student performance reports are automatically created and shared with teachers and administrators. These reports make recommendations for the teacher to provide lessons to students in small groups.

4. Teacher Resources Provide Additional Support.
istation includes an extensive library of Teacher Resources for additional reading support. These resources include 2000 teacher-directed lessons, over 150 decodable books, passages and read aloud books, as well as poetry, rhymes, word banks, and educational games.
istation is a fun and engaging way for students to achieve success in reading!

Sincerely,

APPENDIX B

APPENDIX B: IRB APPROVAL NUMBER

The IRB approval number for this study is 06-05-17-0068073.

APPENDIX C

APPENDIX C

TABLES

Table 1. *Three Views of Multimedia*

View	Definition	Example
Delivery media	Two or more delivery devices	Computer screen and amplified speakers; projectors and lecturer's voice
Presentation mode	Verbal and pictorial representations	On-screen text and animation; printed text and illustrations
Sensory modality	Auditory and visual senses	Narration and animation; lecture and slides

Table 2. *Demographic Characteristics of Students*

Groups	At-Risk Group		Non-At-Risk	
	n	%	n	%
Gender				
Female	40	16.4	84	34.4
Male	37	15.2	83	34.0
Total	77	31.6	167	68.4

Table 3. *ANOVA (BOY and EOY)*

		Sum of Squares	Df	Mean Square	F	Sig.
Score/Sept	Between Groups	88375.681	2	44187.841	1.395	.250
	Within Groups	7600995.750	240	31670.816		
	Total	7689371.437	242			
Score/May	Between Groups	48028.751	238	24014.376	.647	.525
	Within Groups	8837417.251	238	37132.005		
	Total	8885446.002	240			

Table 4. *Scores for September (BOY)*

Scheffe[a,b]

ROI New	N	1	2
3.00	39	1762.8237	1762.8237
		20	
2.00	94	1773.1668	1773.1668
		60	
1.00	109	1840.5295	1840.5295
		3	
Sig		.944	.088

Table 5. *Passing Rate between LEP vs. Non-LEP in 2016 and 2017*

	LEP	N	Mean	Std. Deviation	Std. Error Mean
Pass Third	Y	55	.5455	.5025	.06776
	N	192	.7240	.4482	.0323
Pass Fourth	Y	55	.6182	.4903	.0661
	N	192	.7135	.4532	.0327

Table 6. *Group Statistics (LEP)*

	LEP	N	Mean	Std. Deviation	Std. Error Mean
2016 Scale	Y	55	1371.818	118.9860	16.0441
	N	192	1399.995	203.9586	14.7194
2017 Scale	Y	55	1464.091	142.1054	19.1615
	N	192	1477.943	217.0343	15.6631

Table 7. *Independent Samples t-Test*

		Levene's Test for Equality of Variances		*T*-test for Equality of Means				
		F	Sig	t	df	Sig. (2 tailed)	Mean Diff.	Std. Error Dif.
Pass Third	Equal variances assumed	12.406	.001	-2.533	245	.012	-.31729	-.03971
	Equal variances not assumed			-2.377	80.238	.020	-.32792	-.02909
Pass Fourth	Equal variances assumed	5.318	.022	-1.350	245	.178	-.23444	.04372
	Equal variances not assumed			-1.293	82.284	.200	-.24209	.05137

Table 8. *LEP vs Non-LEP Istation Scores from Sept. 2016 to May 2017*

	LEP	N	Mean	Std. Deviation	Std. Error Mean
Score/ Sept.	Y	55	1768.8808	162.9987	21.9787
	N	188	1809.9177	181.8357	13.2617
Score/Oct.	Y	55	1799.0277	171.8010	23.1656
	N	188	1844.4913	197.8444	14.4292
Score/ Nov.	Y	55	1804.8281	176.9692	23.8625
	N	188	1856.8177	170.6694	12.4473
Score/Dec.	Y	55	1818.9788	190.3125	25.8982
	N	188	1877.3693	183.4634	13.3804
Score/ Jan.	Y	55	1840.0635	177.4045	23.9212
	N	191	1865.8027	192.3081	13.9149
Score/Feb.	Y	55	1839.3208	182.1589	24.5623
	N	191	1888.2905	188.0737	13.6085
Score/ Mar	Y	55	1852.6113	171.6027	23.1389
	N	191	1889.8939	203.6521	14.7354
Score/Apr	Y	55	1856.0049	190.4021	25.6735
	N	187	1910.3501	193.7692	14.1698
Score/ May	Y	54	1857.8833	177.1051	24.1009
	N	187	1907.8120	195.6321	14.3060

Table 9. *Rate of Improvement*

	LEP	N	Mean	Std. Deviation	Std. Error Mean
ROI(new)	Y	55	1.7273	.7316	.0986
	N	191	1.7173	.7353	.0532
ImprovRate	Y	54	5.2945	4.5481	.6189
	N	183	5.2028	5.2970	.3915

Table 10. *Independent Samples Test*

		Levene's Test for Equality of Variances		*T*-test for Equality of Means						
		F	Sig	t	df	Sig. (2 tail)	Mean Dif Low	Up	Std. Error Dif.	95% Conf Interval
2016 Scale	Equal variances assumed	2.208	.139	-1.170	245	.243	-65.2227	55.7550	-175.0429	44.5975
	Equal variances not assumed			-2.677	20.218	.014	-65.2227	24.3639	-116.0098	-14.4356
Pass Third	Equal variances assumed	1.480	.225	-2.053	245	.041.	-.28121	.13696	-.55097	-.01145
	Equal variances not assumed			-1.854	11.915	.089	-.28121	.15165	-.61188	.04957
2017 Scale	Equal variances assumed	.427	.54	-1.066	245	.288	-63.8784	59.9378	-181.9375	54.1807
	Equal variances not assumed			-1.798	14.949	.092	-63.8784	35.5253	-139.6214	11.8646
Pass Fourth	Equal variances assumed	1.696	.194	-2.132	245	.034.	-.28972	.13590	-.55739	-.02204
	Equal variances not assumed			-1.911	11.899	.080	-.28972	.15160	-.62033	.04090

Table 11. *Migrant vs. Non-Migrant STAAR Reading Scores in 2016 and 2017*

	MIGRANT	N	Mean	Std. Deviation	Std. Error Mean
2016 Scale	Y	12	1331.667	72.375	20.893
	N	235	1396.889	192.128	12.533
2017 Scale	Y	12	1414.083	113.942	32.892
	N	235	1477.962	205.751	13.421

Table 12. *Group Statistics for Migrant Students*

	MIGRANT	N	Mean	Std. Deviation	Std. Error Mean
Pass Third	Y	12	.4167	.5149	.1486
	N	235	.6979	.4601	.0300
Pass Fourth	Y	12	.4167	.5149	.1486
	N	235	.7064	.4563	.0297

Table 13. *Independent Samples Test*

		Levene's Test for Equality of Variances		*T*-test for Equality of Means						
		F	Sig	t	df	Sig. (2 tail)	Mean Dif	SE	Conf. Inter	
Pass Third	Equal variances assumed	1.480	.225	-2.053	245	.041	-.281	.136	.555	-.011
	Equal variances not assumed			-1.854	11.915	.089	-281	.151	-.611	.049
Pass Fourth	Equal variances assumed	1.696	.194	-2.132	245	.034	-.289	.135	-.557	-.022
	Equal variances not assumed			-1.911	11.899	.080	-.289	.151	-.620	.040

Table 14. *Group Statistics (Migrant)*

	MIGRANT	N	Mean	Std. Deviation	Std. Error Mean
Score/ Sept.	Y	12	1658.2438	211.6160	61.0883
	N	231	1808.0262	173.7170	11.4297
Score/Oct.	Y	12	1713.6380	222.7892	64.3137
	N	231	1840.4642	189.6444	12.4776
Score/ Nov.	Y	12	1674.8013	220.0999	63.5373
	N	231	1853.8946	166.2158	10.9361
Score/Dec.	Y	12	1735.4631	173.7782	50.1654
	N	230	1871.0640	184.7332	12.1809
Score/ Jan.	Y	12	1764.3448	166.4080	48.0378
	N	234	1864.9559	189.1283	12.36370
Score/Feb.	Y	12	1708.0585	235.4945	67.9814
	N	234	1886.0232	181.1184	11.8400
Score/ Mar	Y	12	1735.3715	295.3254	85.2531
	N	234	1889.0551	188.7459	12.3387
Score/Apr	Y	11	1785.5422	164.0400	49.4599
	N	231	1903.3540	193.9521	12.7611
Score/ May	Y	12	1762.6068	235.8671	68.0889
	N	229	1903.6475	187.8625	12.4143

Table 15. *Rates of Improvement*

	MIGRANT	N	Mean	Std. Deviation	Std. Error Mean
ROI(new)	Y	12	1.9167	.79296	.22891
	N	234	1.7094	.73022	.04774
ImprovRate	Y	12	6.2722	3.69264	1.06597
	N	225	5.1678	5.19251	.34617

Table 16. *Descriptive Statistics*

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Skewness
2016 Raw	247	35.0	5.0	40.0	24.842	8.3717	-.349
2016 Scale	247	1674.0	234.0	1908.0	1393.721	188.5319	-2.799
2017 Raw	247	31.0	5.0	36.0	22.980	7.5930	-.435
2017 Scale	247	1700.0	271.0	1971.0	1474.858	202.5800	-2.768
Valid N	247						

Table 17. *Group Statistics (Gender)*

	Gender	N	Mean	Std. Deviation	Std. Error Mean
2106 Scale	F	124	1406.79	172.16	15.46
	M	123	1380.54	203.56	18.35
2017 Scale	F	124	1497.64	181.83	16.32
	M	123	1451.88	219.89	19.82
Score/Sept	F	122	1818.39	151.69	13.73
	M	121	1782.71	200.57	18.23
Score/May	F	120	1926.79	153.12	13.97
	M	121	1866.69	221.31	20.11

Table 18. *Group Statistics*

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Pass Third	F	124	.6694	.4723	.0424
	M	123	.6992	.4604	.0415
Pass Fourth	F	124	.6935	.4628	.0415
	M	123	.6911	.4639	.0418

Table 19. *Independent Samples Test*

		Levene's Test for Equality of Variances		*T*-test for Equality of Means						
		F	Sig	t	df	Sig. (2 tail)	Mean Dif Up.	Low	Std. Error Dif.	95% Conf Interval
Pass Third	Equal variances assumed	1.008	.316	-.503	245	.616	-.022983	.05936	-.14676	.08710
	Equal variances not assumed		-.503	244.927	.616	-.022983	.05936	-.14675	.08708	
Pass Fourth	Equal variances assumed	.007	.933	.042	245	.966.	.00249	.05897	-.11367	.11865
	Equal variances not assume			.042	244.973	.966	.00249	.05897	-.11367	.11865

Table 20. *Group Statistics*

	Gender	N	Mean	Std. Deviation	Std. Error Mean
2016 Scale	M	123	1380.545	203.561	18.354
	F	124	1406.790	172.169	15.461
2017 Scale	M	123	1451.886	219.896	19.827
	F	124	1497.645	181.837	16.329
Score/Sept	M	121	1782.715	200.576	18.234
	F	122	1818.396	151.692	13.733
Score/May	M	121	1866.699	221.313	20.119
	F	120	1926.799	153.125	13.978

Table 21. Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Diff. Low	Up.	Std. Error Diff	95% Confidence Interval
2016 Scale	Equal variances assumed	.253 .	.616	-1.094	245	.275	-26.245	23.982	-73.483	20.9927
	Equal variances not assumed			-1.094	237.804	.275	-26.245	23.998	-73.522	21.0317
2017 Scale	Equal variances assumed	.482	.488	-1.783	245	.076	-45.759	25.666	-96.314	4.7962
	Equal variances not assumed			-1.781	235.957	.076	-45.759	25.686	-96.362	4.844
Score/Sept	Equal variances assumed	5.249	.023	-1.565	241	.119	-35.681	22.801	-80.597	9.235
	Equal variances not assumed			-1.563	223.450	.119	-35.681	22.827	-80.666	9.303
Score/May	Equal variances assumed -	8.428	.004	-2.450	239	.015	-60.099	24.534	-108.431	-11.767
	Equal variances not assumed			-2.453	213.618	.015	-60.099	24.498	-108.390	-11.809

Table 22. *ANOVA*

		Sum of Squares	df	Mean Square	F	Sig.
Score/Sept	Between Groups	299810.634	2	149905.317	4.906	.008
	Within Groups	7303254.635	239	30557.551		
	Total	7603065.269	241			
Score/May	Between Groups	85831.729	2	42915.864	1.161	.315
	Within Groups	8799614.273	238	36973.169		
	Total	8885446.002	240			

Table 23. Scheffe

Dependent Variable	(I) ROInew	(J) ROInew	Mean Difference (I-J)	Std. Error	Sig	95% Confidence Interval	
						Lower Bound	Upper Bound
Score/Sept	1.00	2.00	67.36271140*	24.60538213	.025	6.7555258	127.9698970
		3.00	77.70580494	32.61704225	.061	-2.6354441	158.0470540
	2.00	1.00	-67.36271140*	24.60538213	.025	-127.969897	6.7555258
		3.00	10.34309354	33.29575454	.953	-71.6699378	92.3561248
	3.00	1.00	-77.70580494	32.61704225	.061	-158.0470540	2.6354441
		2.00	-10.34309354	33.29575454	.953	-92.3561248	71.6699378
Score/May	1.00	2.00	-20.62494985	27.25994492	.751	-87.7725447	46.5226450
		3.00	-53.18606966	35.31753463	.323	-140.1813850	33.8092457
	2.00	1.00	20.62494985	27.25994492	.751	-46.5226450	87.7725447
		3.00	-32.56111981	36.04643636	.665	-121.3518899	56.2296503
	3.00	1.00	53.18606966	35.31753463	.323	-33.8092457	140.1813850
		2.00	32.56111981	36.04643636	.665	-56.229650	121.3518899

Table 24. *ANOVA (Istation Rate of improvement for Index Scores)*

		Sum of Squares	df	Mean Square	F	Sig
Score/ May	Between Groups	85831.729	2	42915.864	1.161	.315
	Total	8885446.002	240	36973.169		
	Between Groups	299810.634	2	149905.317	4.906	.008
	Within Groups	7303254.635	239	30557.551		
	Total	7603065.269	241			

Table 25. *Istation-Time Usage*

Group Statistics

Usage Time	Gender	N	Mean	Std. Deviation	Std. Error Mean
	M	123	1313.6863	458.60463	41.35099
	F	124	1319.7873	429.61008	38.58012

Table 26. *Independent Samples Test*

Independent Samples Test

		Levene's Test for Equality of Variances		*t*-test for Equality of Means					
		F	Sig	t	df	Sig. (2 tail)	Mean Dif	Std. Error Dif. Upper	95% Conf Interval Lower
Usage Time	Equal variances assumed	.554	.457	-.108	245	.914	-6.10100	56.53879	-117.46511
	Equal variances not assumed			-.108	243.690	.914	-6.10100	56.55378	117.49761

Table 27. *Group Statistics*

	LEP	N	Mean	Std. Deviation	Std. Error Mean
Usage Time	Y	55	1335.7049	427.1650	57.5989
	N	192	1311.3192	448.8716	32.3945

Table 28. *Independent Samples Test*

		Levene's Test for Equality of Variances		*t*-test for Equality of Means						
		F	Sig	t	df	Sig. (2 tail)	Mean Dif Up.	Lower	Std. Error Dif	95% Conf Interval
Usage Time	Equal Variances Assumed	.100	.752	.359	245	.720	24.385	67.931	-109.419	158.190
	Equal Variances Not assumed			.369	90.991	.713	24.385	66.083	-106.881	155.652

Table 29. *Group Statistics*

	Migrant	N	Mean	Std. Deviation	Std. Error Mean
Usage Time	Y	12	1268.7892	454.54842	131.21682
	N	235	1319.1982	443.66781	28.94170

Table 30. *Independent Samples Test*

		Levene's Test for Equality of Variances		*t*-test for Equality of Means						
		F	Sig	t	df	Sig. (2 tail)	Mean Dif	Std. Error Dif	95% Interval Up.	Low
Usage Time	Equal variances assumed	.097	.755	-.383	245	.702	-50.409	131.451	309.328	208.510
	Equal variances not assumed			-.375	12.095	.714	-50.409	134.3706	-342.922	242.104

Table 31. *ANOVA*

Usage Time

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	144121.203	2	72060.602	.374	.689
Within Groups	46867472.307	243	192870.256		
Total	47011593.510	245			

Table 32. *Multiple Comparisons*

Dependent Variable: UsageTime

Scheffe

Dependent Variable	(I) ROInew	(J) ROInew	Mean Diff. (I-J)	Std. Error	Sig	95% Conf. Interval	
						Lower	Upper
	1.00	2.00	53.0184	61.510	.690	98.477	204.514
		3.00	29.501	80.358	.935	-168.414	227.418
	2.00	1.00	-53.0184	61.510	.690	-204.514	98.477
		3.00	-23.516	82.063	.960	-225.630	178.598
	3.00	1.00	-29.501	80.3586	.935	-227.418	168.414
		2.00	23.516	82.063	.960	-178.598	225.630

Table 33. *Correlations*

			2016 Scale	2017 Scale	PassThird	PassFourth	Score/Sept	Score/May	UsageTime	ROInew	ImprovRate
2016 Scale	Pearson Correlation		1	.884**	.507**	.408**	.737**	.742**	.110	-.079	.137*
	Sig. (2-tailed)			.000	.000	.000	.000	.000	.085	.216	.035
	N	247	247	247	247	243	241	247	246	237	
2017 Scale	Pearson Correlation		.884**	1	.385**	.491**	.742**	.771**	.101	-.046	.207**
	Sig. (2-tailed)		.000		.000	.000	.000	.000	.113	.475	.001
	N	247	247	247	247	243	241	247	246	237	
PassThird	Pearson Correlation		.507**	.385**	1	.660**	.557**	.490**	-.033	-.070	-.092
	Sig. (2-tailed)		.000	.000		.000	.000	.000	.608	.273	.157
	N	247	247	247	247	243	241	247	246	237	
PassFourth	Pearson Correlation		.408**	.491**	.660**	1	.530**	.518**	-.037	-.013	.064
	Sig. (2-tailed)		.000	.000	.000		.000	.000	.566	.845	.325
	N	247	247	247	247	243	241	247	246	237	
Score/Sept	Pearson Correlation		.737**	.742**	.557**	.530**	1	.889**	.097	-.184**	-.116
	Sig. (2-tailed)		.000	.000	.000	.000		.000	.133	.004	.075
	N	243	243	243	243	243	237	243	242	237	
Score/May	Pearson Correlation		.742**	.771**	.490**	.518**	.889**	1	.078	.097	.348**
	Sig. (2-tailed)		.000	.000	.000	.000	.000		.230	.132	.000
	N	241	241	241	241	237	241	241	241	237	
UsageTime	Pearson Correlation		.110	.101	-.033	-.037	.097	.078	1	-.038	.078
	Sig. (2-tailed)		.085	.113	.608	.566	.133	.230		.557	.231
	N	247	247	247	247	243	241	247	246	237	
ROInew	Pearson Correlation		-.079	-.046	-.070	-.013	-.184**	.097	-.038	1	.551**
	Sig. (2-tailed)		.216	.475	.273	.845	.004	.132	.557		.000
	N	246	246	246	246	242	241	246	246	237	
ImprovRate	Pearson Correlation		.137*	.207**	-.092	.064	-.116	.348**	.078	.551**	1
	Sig. (2-tailed)		.035	.001	.157	.325	.075	.000	.231	.000	
	N	237	237	237	237	237	237	237	237	237	

Table 34. *(2015-2016) STAAR Reading Results Per Campus*

Campus	Test	All	Male	Female	Eco	Migrant	LEP	SPED
School A	3rd Reading	69%	66%	72%	66%	25%	35%	40%
School B	3rd Reading	72%	68%	75%	68%	50%	64%	25%
School C	3rd Reading	56%	64%	49%	58%	50%	52%	25%
District-Wide	3rd Reading	66%	66%	66%	64%	42%	50%	31%

Table 35. *(2016-2017) STAAR Reading Results Per Campus*

Campus	Test	All	Male	Female	Eco	Migrant	LEP	SPED
School A	4th Reading	78%	72%	85%	78%	25%	53%	36%
School B	4th Reading	69%	68%	70%	65%	50%	71%	0%
School C	4th Reading	60%	66%	53%	59%	50%	40%	13%
District-Wide	4th Reading	70%	69%	70%	68%	40%	50%	20%

Table 36. *Istation Rate of Improvement (Monthly)*

Index Scores

Month	Non At-Risk	(SD)	At-Risk	(SD)
September	1868.75	150.33	1656.51	153.91
October	1906.87	145.71	1680.47	189.23
November	1912.83	133.24	1701.66	156.23
December	1932.40	149.58	1718.49	167.56
January	1924.59	147.49	1721.01	192.30
February	1947.02	156.53	1727.25	159.68
March	1946.52	155.95	1742.05	196.94
April	1962.90	176.26	1753.48	155.18
May	1960.42	169.83	1757.12	152.

Table 37. *Rate of Improvement (ROI)*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		2	.8	.8	.8
	High	41	16.5	16.5	17.3
	Low	110	44.2	44.2	61.4
	Moderate	95	38.2	38.2	99.6
	N/A	1	.4	.4	100.0
	Total	249	100.0	100.0	

Table 38. *Group Statistics (LEP)*

	LEP	N	Mean	Std. Deviation	Std. Error Mean
2016 Scale	Y	55	1371.818	118.986	16.044
	N	192	1399.995	203.958	14.719
2017 Scale	Y	55	1464.091	142.105	19.161
	N	192	1477.943	217.034	15.663
Score/Sept	Y	55	1768.880	162.998	21.978
	N	188	1809.917	181.835	13.261
Score/May	Y	54	1857.883	177.105	24.100
	N	187	1907.81	195.632	14.300

Table 39. *ANOVA*

		Sum of Squares	df	Mean Square	F	Sig.
2016 Raw	Between Groups	69.003	2	34.501	.490	.613
	Within Groups	17120.395	243	70.454		
	Total	17189.398	245			
2016 Scale	Between Groups	124722.002	2	62361.001	1.761	.174
	Within Groups	8606954.750	243	35419.567		
	Total	8731676.752	245			
2017 Raw	Between Groups	21.223	2	10.612	.184	.832
	Within Groups	14017.578	243	57.686		
	Total	14038.801	245			
2017 Scale	Between Groups	78706.436	2	39353.218	.957	.385
	Within Groups	9988178.573	243	41103.616		
	Total	10066885.010	245			
Score/Sept	Between Groups	299810.634	2	149905.317	4.906	.008
	Within Groups	7303254.635	239	30557.551		
	Total	7603065.269	241			
Score/May	Between Groups	85831.729	2	42915.864	1.161	.315
	Within Groups	8799614.273	238	36973.169		
	Total	8885446.002	240			

Table 40. *Independent Samples Test*

		T-test for Equality of Means			
		t	df	Sig. (2 tailed)	Mean Diff.
2016 Scale	Equal variances assumed	-5.110	160	.000	-141.043
	Equal variances not assumed	-5.971	98.587	.000	-141.043
2017 Scale	Equal variances assumed	-3.616	160	.000	-118.572
	Equal variances not assumed	-4.098	123.604	.000	-118.572
Score/Sept	Equal variances assumed	-5.212	158	.000	-130.668
	Equal variances not assumed	-5.624	156.387	.000	-130.668
Score/Oct	Equal variances assumed	-4.691	157	.000	-133.868
	Equal variances not assumed	-5.172	145.948	.000	-133.868
Score/Nov	Equal variances assumed	-4.813	158	.000	-119.651
	Equal variances not assumed	-5.117	157.391	.000	-119.651
Score/Dec	Equal variances assumed	-3.889	157	.000	-106.863
	Equal variances not assumed	-4.101	156.876	.000	-106.863

Score/Jan	Equal variances assumed	-3.998	160	.000	-113.418
	Equal variances not assumed	-4.316	155.011	.000	-113.418
Score/Feb	Equal variances assumed	-4.297	160	.000	-111.283
	Equal variances not assumed	-4.654	153.761	.000	-111.283
Score/ March	Equal variances assumed	-3.689	160	.000	-109.301
	Equal variances not assumed	-3.966	156.470	.000	-109.301
Score/Apr	Equal variances assumed	-4.160	156	.000	-116.459
	Equal variances not assumed	-4.417	154.342	.000	-116.459
Score/May	Equal variances assumed	-4.160	156	.000	-116.459
	Equal variances not assumed	-4.417	154.342	.000	-116.459

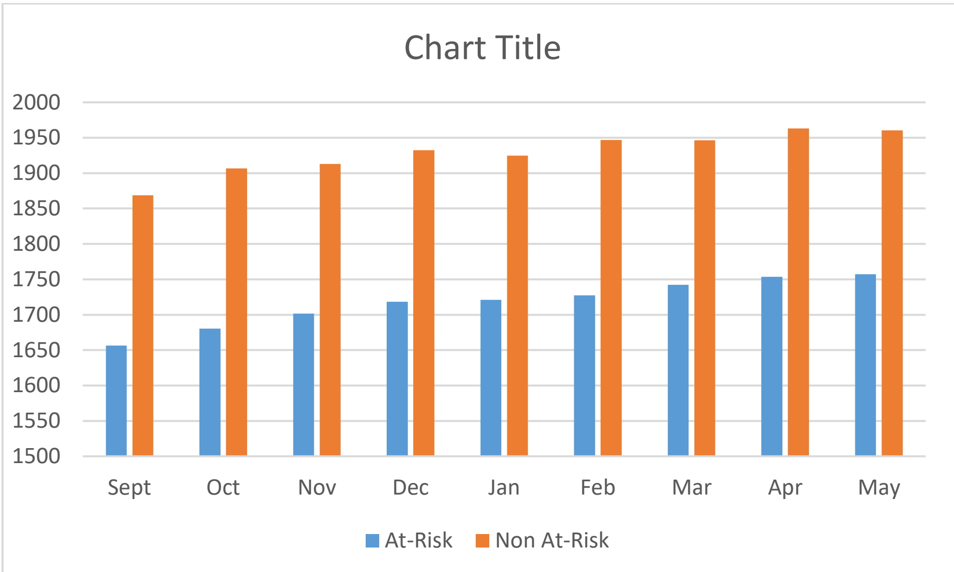
Table 41. *T-Test (Paired Samples Statistics)*

group	1=unsatisfactory ;2=satisfactory; 3=advanced		Mean	N	Std. Deviation	Std. Error Mean
1.00	Pair 1	2016 Scale	1258.883	94	225.630	23.272
		2017 Scale	1364.149	94	258.453	26.657
	Pair 2	2016 Raw	17.245	94	7.3845	.761
		2017 Raw	18.106	94	7.602	.784
	Pair 5	Score/Sept	1687.911	92	172.039	17.936
		Score/May	1778.488	92	200.737	20.928
2.00	Pair 1	2016 Scale	1399.926	68	33.379	4.047
		2017 Scale	1482.721	68	92.719	11.243
	Pair 2	2016 Raw	25.074	68	2.599	.315
		2017 Raw	23.044	68	5.538	.671
	Pair 5	Score/Sept	1812.627	64	113.937	14.242
		Score/May	1904.561	64	120.5135	15.064
3.00	Pair 1	2016 Scale	1537.871	85	73.7428	7.998
		2017 Scale	1591.000	85	109.3493	11.860
	Pair 2	2016 Raw	33.059	85	2.5558	.277
		2017 Raw	28.318	85	4.9981	.542
	Pair 5	Score/Sept	1927.418	81	119.0403	13.226
		Score/May	2024.532	81	142.8407	15.871

APPENDIX D

APPENDIX D

Figure 2. *Istation Rate of Improvement Index Scores*



BIOGRAPHICAL SKETCH

Andres Martinez was born in San Benito, Texas to Porfirio and Manuela Martinez on April 11, 1959. Andres Martinez graduated from San Benito Independent School District in 1977. He attended Pan American University in Brownsville, Texas from 1986 to 1990 where he obtained his Bachelor of Arts in Business. He completed his undergraduate work and received a Bilingual Teaching Certificate in 1992. After graduation from college, he began his teaching career with the Santa Rosa Independent School District where he taught for 11 years. He completed his studies for a Master's Degree in Educational Leadership in 1996 with Mid-Management Certification in 1998. He was called for Active Duty during 2001-2002 Homeland Security Campaign. After the military mobilization, he continued working for the Santa Rosa school district as an administrator for one year and moved to the Brownville Independent School District for one year followed by two years at the Monte Alto Independent School District as a Vice-Principal for two years. He also worked in the La Feria Independent School District for eight years as a 5th and 6th grade math and science teacher. He completed his doctoral degree in 2019. He currently lives in La Feria, Texas and is employed with the Brownsville Independent School District where he has served as a middle school assistant principal. His next goal is to pursue the certification for Superintendent of schools. His permanent address is: 308 Cooper Lane, La Feria, Texas 78559.